



# SSC JE 2019-20

Electrical Engineering

Mega Mock Challenge  
(May 09- May 10 2020)

Questions &  
Solutions

1. Select the word-pair in which the two words are related in the same way as are the two words in the following word-pair.

Trim : Hair

A. Dog : Stag

B. Eye : Red

C. Prune : Shrub

D. Nail : Face

Ans. C

Sol. We trim hair to shorten the length of hair in a same way prune does shorten the length of shrub.

Hence, option C is the correct answer.

2. In a certain code language, 'BOOT' is written as 'UPPC'. How is 'LOOP' written in that code language?

A. NPPT

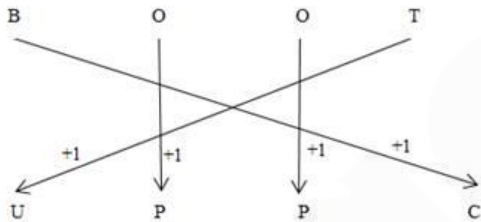
B. QPPM

C. KPPT

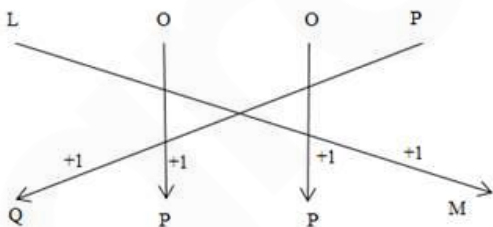
D. LPPG

Ans. B

Sol. BOOT is written as UPPC



Similarly, LOOP is written as,



So, LOOP is written as QPPM.

Hence, option B is the correct answer.

3. In the following question, select the related number from the given alternatives.

119 : 10 :: 476 : ?

A. 65

B. 55

C. 24

D. 52

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Ans. D

Sol.  $1 \times (1 + 9) = 1 \times 10 = 10$

In the same way,

$4 \times (7 + 6) = 4 \times 13 = 52$

Thus,  $119 : 10 :: 476 : 52$

Hence, option D is the correct answer.

4. Which of the following will appear third, if they are arranged according to a dictionary

- (A) Autumn
- (B) Austere
- (C) Assert
- (D) Auspicious
- A. (A)
- B. (B)
- C. (C)
- D. (D)

Ans. B

Sol. After arranging the given words,

- (C) Assert
- (D) Auspicious
- (B) Austere
- (A) Autumn

Hence, Austere will appear third, if they are arranged according to a dictionary.

Hence, option B is the correct answer.

5. A + B means 'A is the daughter of B'

A - B means 'A is the wife of B'

A x B means. 'A is the husband of B'

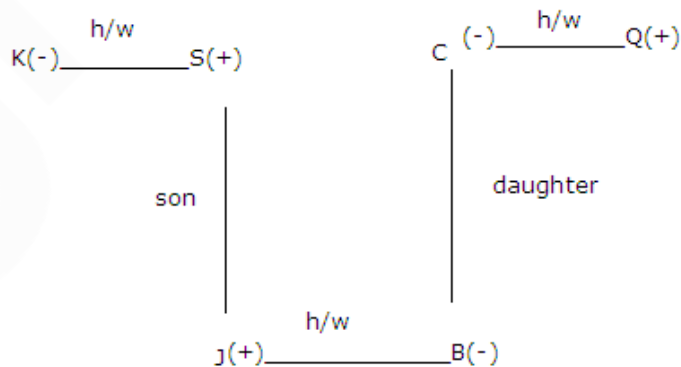
A ÷ B means 'A is the father of B'

How is Q related to J in the expression K - S ÷ J x B + C - Q?

- A. Father
- B. Father-in-law
- C. Maternal grandfather
- D. Son

Ans. B

Sol. The expression K - S ÷ J x B + C - Q can be represented as given below-



From the above diagram its clear that Q is the father-in-law of J.

Hence, option B is the correct answer.

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6. Study the statements, select the right conclusion.

Statement : In recent survey report, it is said that who eat green vegetables daily they face less heart problems.

Conclusion :

I. Eating green vegetables is necessary for healthy life.

II. All people who are doing sitting job, necessarily faces heart problems

A. Only conclusion I follows

B. Neither I nor II conclusion follows

C. Only conclusion II follows

D. Either I or II conclusion follows

Ans. A

Sol. According to a recent survey, eating green vegetables are necessary for healthy life as they help in reducing the health problem.

Hence, conclusion I follows.

Hence, option A is the correct answer.

7. If 'A' denotes '+', 'B' denotes '-', 'C' denotes '÷' and 'D' denotes '×', then what will be the value of the following expression?

87 B 56 C 8 A 4 D 5

A. 110

B. 120

C. 100

D. 140

Ans. C

Sol. Its given that 'A' denotes '+', 'B' denotes '-', 'C' denotes '÷' and 'D' denotes '×'.

87 B 56 C 8 A 4 D 5

After interchanging-

87 — 56 ÷ 8 + 4 × 5

Apply BODMAS,

87 — 56 ÷ 8 + 4 × 5

=87 — 7 + 20

=80+20=100

Hence, option C is the correct answer.

8. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

Q, P, M, H, ?

A. E

B. A

C. Z

D. X

Ans. B

Sol. Given series follows the pattern given below:

Q  $\xrightarrow{-1}$  P  $\xrightarrow{-3}$  M  $\xrightarrow{-5}$  H  $\xrightarrow{-7}$  A

Hence, option B is the correct answer.

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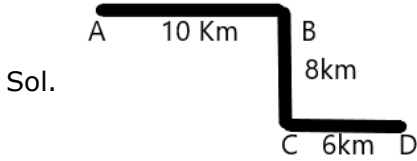
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9. A man walks 10 km towards east, then takes a right turn and walks 8 km and again takes left and walks 6 km. In which direction is the man with respect to his starting position?

- A. Northeast
- B. Southwest
- C. Southeast
- D. Northwest

Ans. C



As the man starts from point A and reaches at point D according to the question. So, the direction of the man at D with respect to A is South East.

Hence, option C is the correct answer.

10. Select the option which is related to the third number as the second number is related to the first number.

16 : 68 :: 28 : \_\_\_\_\_

- A. 119
- B. 77
- C. 346
- D. 49

Ans. A

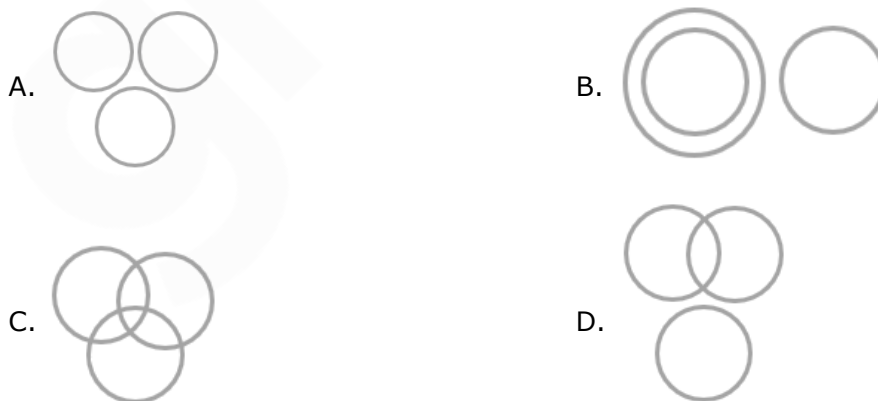
Sol. As,  $16 \times (17/4) = 68$

Similarly,  $28 \times (17/4) = 119$

Hence, option A is the correct answer.

11. Identify the diagram that best represents the relationship among the given classes.

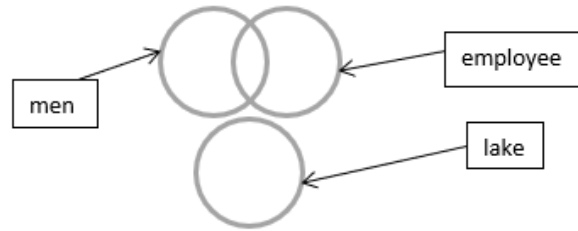
Lake, Men and Employee



Ans. D

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Sol. Some men can be an employee. But Lake is completely a different entity.



Hence, option D best represents the relationship between the given classes.

Hence, option D is the correct answer.

12. Select the option in which the words share the same relationship as that shared by the given set of words (in the same order).

Slit : Pierce : Cut

A. Work : Rest : Play

B. Less : Few : More

C. Harrow : Plough : Dig

D. Watch : Ignore : Disregard

Ans. C

Sol. As, Slit, Pierce and Cut have the same meanings.

Similarly,

Harrow, Plough and Dig have the same meanings.

Hence, option C is the correct answer.

13. In the following question, some statements followed by some conclusions are given. Taking the given statements to be true even if they seem to be at variance from commonly known facts, read all the conclusions and then decide which of the given conclusions logically follows the given statements.

Statements:

1. Some Boys are Girls.

2. No Boys are students.

Conclusions:

I. All girls can be students.

II. No students are boys.

A. Only conclusion II follows.

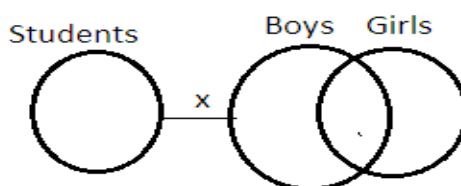
B. Only conclusion I follows.

C. Both conclusion I and II follow.

D. Neither conclusion I nor II follow.

Ans. A

Sol. The least Possible Venn-diagram is-



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Conclusion:

I. All girls can be students -(It does not follow as No Boys are students given in the statement.)

II. No students are boys -(It follows as clearly given that No Boys are students.)

So, only conclusion II follows.

Hence, option A is the correct answer.

14. In the following question, select the odd word from the given alternatives.

A. Square

B. Rectangle

C. Cylinder

D. Triangle

Ans. C

Sol. All are 2-Dimensional figures except 'Cylinder'.

Hence, option C is the correct answer.

15. In the following number series, which number will replace the question mark (?) in the series?

3, ?, 101, 10202

A. 95

B. 10

C. 99

D. 100

Ans. B

Sol. Logic-

$$3^2+1=9+1=10$$

$$10^2+1=100+1=101$$

$$101^2+1=10201+1=10202$$

Hence, option B is the correct answer.

16. In a row of boys, Shiv is 7<sup>th</sup> from the left and Saurabh is 9<sup>th</sup> from the right. When they exchange their positions, Shiv becomes 15<sup>th</sup> from left. What will be the Saurabh's new position from right?

A. 16

B. 17

C. 15

D. 18

Ans. B

Sol. Shiv = 7<sup>th</sup> from left

Saurabh = 9<sup>th</sup> from right.

After exchanging Position, Shiv = 15<sup>th</sup> from left so, after Shiv there are 8 boys.

$$\text{Total number of boys} = 15 + 8 = 23$$

Saurabh = 7<sup>th</sup> from left, =>  $23 - 7 + 1 = 17^{\text{th}}$  from right.

Hence, option B is the correct answer.

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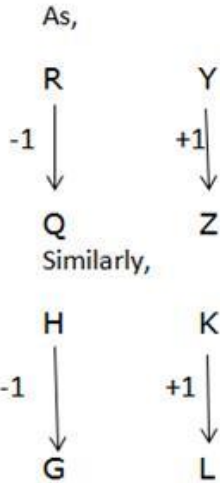
17. Select the option that is related to the third term in the same way as the second term is related to the first term.

RY : QZ :: HK : \_\_\_\_\_

- A. GL
- B. IM
- C. GJ
- D. IL

Ans. A

Sol.



Hence, option A is the correct answer

18. Three of the following four option are similar in a certain way and one is different. Find the one that is different.

- A. 14 - 70 - 85
- B. 9 - 45 - 60
- C. 11 - 55 - 70
- D. 7 - 42 - 58

Ans. D

Sol. From the given options,

Option A - (14 - 70 - 85)

$14 \times 5 = 70$

$70 + 15 = 85$

Option B - (9 - 45 - 60)

$9 \times 5 = 45$

$45 + 15 = 60$

Option C - (11 - 55 - 70)

$11 \times 5 = 55$

$55 + 15 = 70$

Option D - (7 - 42 - 58)

$7 \times 6 = 42$

$42 + 16 = 58$

Hence, option D is the correct answer.

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19. Arrange the given words in the sequence in which they occur in the dictionary.

- |            |              |
|------------|--------------|
| 1) Attempt | 2) Alert     |
| 3) Attach  | 4) Assistant |
| 5) Assume  |              |
| A. 13452   | B. 24531     |
| C. 42531   | D. 53412     |

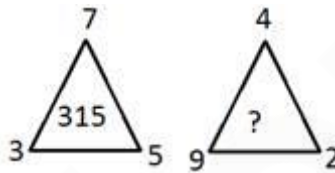
Ans. B

Sol. Arranging the words in the order they appear in the dictionary:

- |            |              |
|------------|--------------|
| 2) Alert   | 4) Assistant |
| 5) Assume  | 3) Attach    |
| 1) Attempt |              |

Hence, option B is the correct answer.

20. In the following question, select the missing number from the given alternatives.



- |        |        |
|--------|--------|
| A. 126 | B. 216 |
| C. 326 | D. 387 |

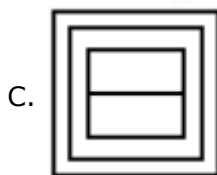
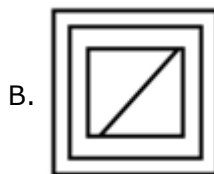
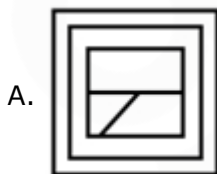
Ans. B

Sol. We have,  $(7 \times 3 \times 5) \times 3 = 105 \times 3 = 315$

Therefore, missing number =  $(4 \times 9 \times 2) \times 3 = 72 \times 3 = 216$

Hence, option B is the correct answer.

21. From the given answer figures, select the one in which the question figure is hidden/embedded.



Ans. D

Sol. After observing the given diagram carefully, the question figure is embedded in option figure (D).



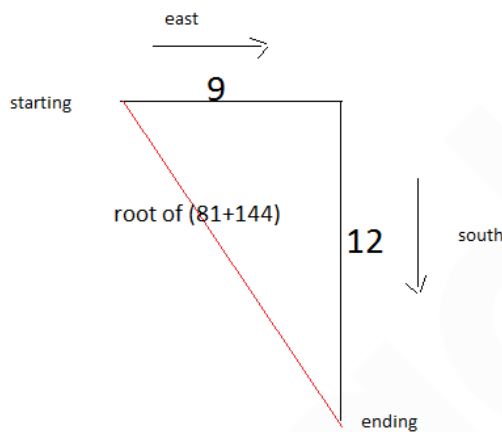
Hence, option D is the correct answer.

22. A man walked 9 km towards East and then 12 km towards South. How far is he from the starting point?

- A. 8 km
- B. 6 km
- C. 15 km
- D. 7.5 km

Ans. C

Sol.



Distance between starting and ending point

$$\begin{aligned} &= \sqrt{9^2 + 12^2} \\ &= \sqrt{81 + 144} \\ &= \sqrt{225} \\ &= 15\text{km} \end{aligned}$$

Hence, option C is the correct answer.

23. In the following four words, three words are same in a certain context and one word is different from others. Find the different word.

- A. Shoot
- B. Purify
- C. Oar
- D. Guard

Ans. C

Sol. Except Oar, all are the action taken by a certain tool. An oar is a tool.

Hence, option C is the correct answer.

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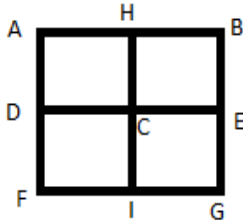
24. How many rectangles are there in the given figure?



- A. 10
- B. 9
- C. 12
- D. 8

Ans. B

Sol. In this question, we show that the figure is given below,



Number of rectangles - ADHC, CHBE, DFCI, CIGE, AHFI, HIGB, ADEB, DFGE, ABFG

So, the total number of rectangles is 9.

(Note: every square is a rectangle because it is a quadrilateral with all four angles right angles but not every rectangle is square).

Hence, option B is the correct answer.

25. In the following question, select the odd letter from the given alternatives.

R : X :: V : ?

- A. B
- B. P
- C. K
- D. W

Ans. A

Sol. As,

$$R \xrightarrow{+6} X$$

Similarly,

$$V \xrightarrow{+6} B$$

Thus, R : X :: V : B

Hence, option A is the correct answer

26. In the following question, select the odd word pair from the given alternatives.

- A. India : Kolkata
- B. Grocer : Shop
- C. Pilot : Cockpit
- D. Engineer : Site

Ans. A

Sol. Except for India(Country) : Kolkata(old capital), all show relationship- Worker: its working place

Hence, option A is the correct answer.

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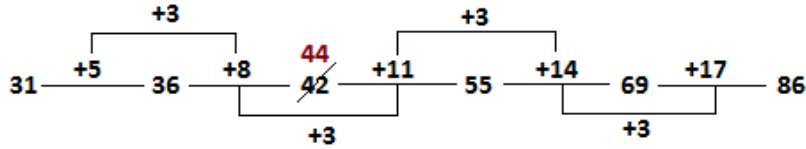
27. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

31, 36, 42, 55, 69, 86

- A. 42
- B. 55
- C. 86
- D. 31

Ans. A

Sol.



Hence, option A is the correct answer.

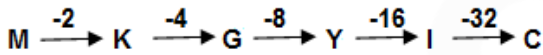
28. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

M, K, G, Y, I, ?

- A. A
- B. E
- C. C
- D. G

Ans. C

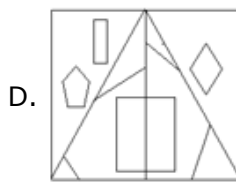
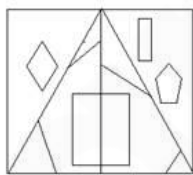
Sol. In this question, we show that -



So ? = C

Hence, option C is the correct answer.

29. If a mirror is placed on the right-hand side of the given figure, then which of the answer figures is the right image of the given figure?

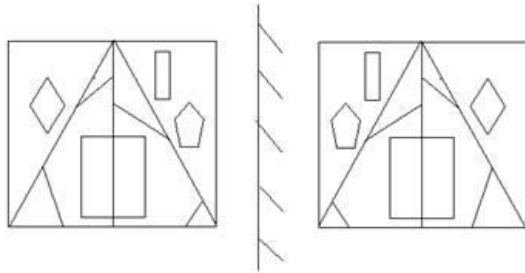


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Ans. D

Sol. The correct right image of the given figure is depicted in option figure D.



Hence, option D is the correct answer.

30. Which of the given responses would be a meaningful order of the following?

- 1) Item
  - 2) Delivery
  - 3) Flipkart
  - 4) Review
  - 5) Buy
- A. 3, 1, 5, 2, 4                      B. 1, 3, 5, 2, 4  
 C. 3, 1, 2, 5, 4                      D. 3, 1, 5, 4, 2

Ans. A

Sol. 3) Flipkart [first you go to any online shopping website as here mentioned flipkart]

- 1) Item [Now you search for your item]
- 5) Buy [then you purchase/buy it]
- 2) Delivery [then you get your product at your respective address]
- 4) Review [after checking/using the item you write a review]

Correct sequence = 3, 1, 5, 2, 4

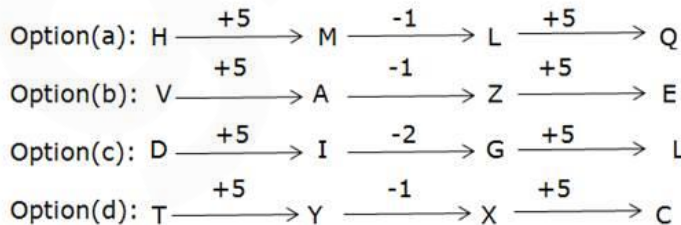
Hence, option A is the correct answer.

31. Three of the following four letter-clusters are alike in a certain way and one is different.

Find the odd one out.

- A. HMLQ
- B. VAZE
- C. DIGL
- D. TYXC

Ans. C



Sol.

Hence, option C is the correct answer.

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Statement:

a) Some watches are devices.

b) Some devices are hands.

Conclusion:

I. Some hands are watches.

II. No hand is watch.

A. Only conclusion II follows

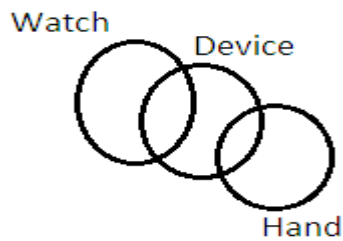
B. Neither conclusion I nor conclusion II follow

C. Only conclusion I follows

D. Either conclusion I or conclusion II follows

Ans. D

Sol. Minimum Possible diagram is-



Conclusion:

I. Some hands are watches.( It does not follow independently as its just a possibility, not surety.)

II. No hand is watch. ( It also does not follow independently as its just a possibility, not surety.)

As, we see no negative statements given in the questions, so here some + No will make either or occurrence situation.

So, Either conclusion I or conclusion II follows.

Hence, option D is the correct answer.

36. In the following question, select the related number from the given alternatives.

JY : 35 : : RT : ?

A. 48

B. 38

C. 35

D. 24

Ans. B

Sol. There are 26 alphabets in English and if we assign numbers to each and every alphabet starting from 'A', 'B', 'C etc., it will appear to be:

A=1, B=2, C=3, D=4..... likewise, till Z=26

Here, J + Y = 10 + 25 = 35

Likewise, R + T = 18 + 20 = 38

Hence, option B is the correct answer

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37. Three of the following four letter-clusters are alike in a certain way and one is different.  
Pick the odd one out.

- A. GJIL
- B. MPNQ
- C. VYXA
- D. JMLO

Ans. B

Sol. Pattern is-

Option(a)-  $G \xrightarrow{+3} J \xrightarrow{-1} I \xrightarrow{+3} L$

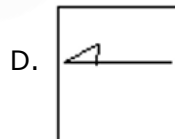
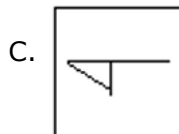
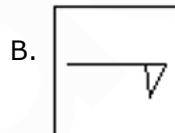
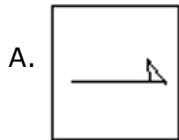
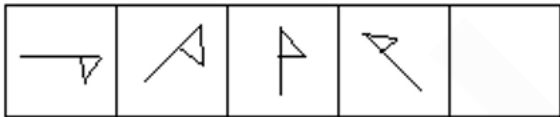
Option(b)-  $M \xrightarrow{+3} P \xrightarrow{-2} N \xrightarrow{+3} Q$

Option(c)-  $V \xrightarrow{+3} Y \xrightarrow{-1} X \xrightarrow{+3} A$

Option(d)-  $J \xrightarrow{+3} M \xrightarrow{-1} L \xrightarrow{+3} O$

Hence, option B is the correct answer.

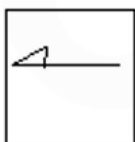
38. Select the figure that will come next in the following series:



Ans. D

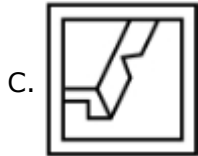
Sol. Logic - Figure is moving 45° anti clock wise.

So, the next figure is



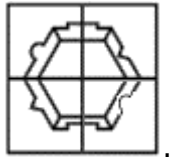
Hence, option D is the correct answer.

39. Which answer figure will complete the pattern in the question figure?



Ans. A

Sol. As shown below option A is the right image to complete the given figure –



Hence, option A is the correct answer.

40. Three of the following four letter-clusters are alike in a certain way and one is different.

Pick the odd one out.

A. OSUV

B. DFHJ

C. JLNP

D. CEGI

Ans. A

Sol. The pattern is:

$D (+2) = F, F (+2) = H, H (+2) = J.$

$J (+2) = L, L (+2) = N, N (+2) = P.$

$C (+2) = E, E (+2) = G, G (+2) = I.$

But,

$O (+4) = S, S (+2) = U, U (+1) = V.$

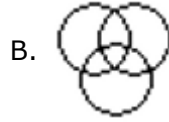
Hence, option A is the correct answer.

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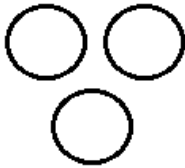


41. Which of the following diagrams indicates the best relation between administration, finance, accounts?



Ans. C

Sol. Administration, finance and accounts are different types of departments in any organization, there is no relationship between them. Hence, all the three are represented by three different circles.



Hence, option C. is the correct answer.

42 The sequence of folding a piece of square paper (figures X and Y) and the manner in which the folded paper has been cut (figure Z) are shown. How will the paper appear when unfolded?



Ans. C

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Sol. The paper is unfolded in two steps:-

Step-1

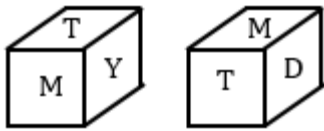


Step-2



Hence, option C is the correct answer.

43. Find the letter is opposite to Y?



- A. P
- B. D
- C. T
- D. M

Ans. B

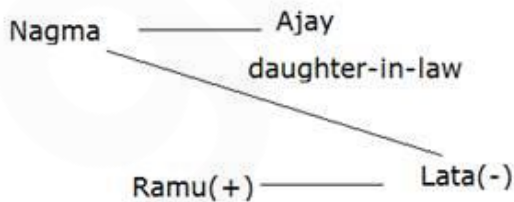
Sol. According to the rule, when two faces are the same in two different positions of dice then the face which is not common is opposite to each other. Therefore, D is the opposite of Y. Hence, option B is the correct answer.

44. Ramu married to Lata who is the daughter-in-law of Nagma. Nagma is married to Married to Ajay, How is Ajay related to Lata?

- A. Father-in-law
- B. Mother
- C. Mother-in-law
- D. Can't be determined

Ans. D

Sol. From the information given in the question, we can draw the following diagram-



Its clear from the above figure that the gender of either Nagma or Ajay is not defined. (Name does not specify the gender)

Therefore, we Can not determine the exact relationship between Ajay and Lata.

Hence, option D is the correct answer.

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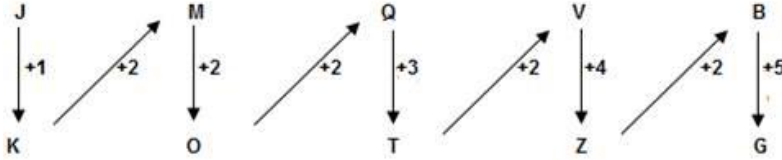
45. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

JK, MO, QT, VZ, ?

- A. BH
- B. BF
- C. BG
- D. CG

Ans. C

Sol. In this question, we show that -



So ? = BG

Hence, option C is the correct answer.

46. Three of the following four option are similar in a certain way and one is different. Find the one that is different.

- A. 7 — 21 — 126
- B. 4 — 12 — 72
- C. 5 — 15 — 105
- D. 9 — 27 — 162

Ans. C

Sol. Pattern follows here is:

$7 \times 3 = 21, 21 \times 6 = 126$   
 $4 \times 3 = 12, 12 \times 6 = 72$   
 $5 \times 3 = 15, 15 \times 7 = 105$   
 $9 \times 3 = 27, 27 \times 6 = 162$

Hence, option C is the correct answer.

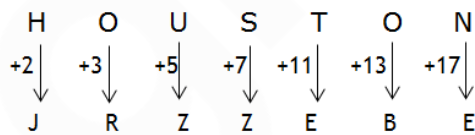
47. If HOUSTON is coded as JRZZEBE, then how will HOWDY be coded as?

- A. JROUJ
- B. JMQKJ
- C. JRBKJ
- D. JRBLT

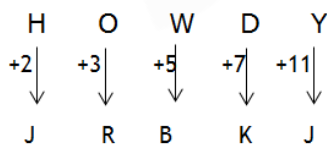
Ans. C

Sol. Logic- Addition of consecutive prime numbers.

As,



Similarly,



Hence, option C is the correct answer.

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48. From the given words, select the word which can be formed using the letters of the given word.

DIVERSIFY

A. SERIF

B. DERMIS

C. FIBERS

D. FRISKY

Ans. A

Sol. DERMIS → Letter 'M' is not present in word DIVERSIFY.

FIBERS → Letter 'B' is not present in word DIVERSIFY.

FRISKY → Letter 'K' is not present in word DIVERSIFY.

All letters of the word SERIF are present in DIVERSIFY.

Thus word SERIF can be formed from the word DIVERSIFY.

Hence, option A is the correct answer.

49. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

9, 23, 43, ?, 101

A. 64

B. 69

C. 67

D. 60

Ans. B

Sol. Logic is-

$$(2^3-1^3)+2=(8-1)+2=7+2=9$$

$$(3^3-2^3)+4=(27-8)+4=19+4=23$$

$$(4^3-3^3)+6=(64-27)+6=37+6=43$$

$$(5^3-4^3)+8=(125-64)+8=61+8=69$$

$$(6^3-5^3)+10=(216-125)+10=91+10=101$$

Hence, option B is the correct answer.

50. In the following question, select the related word from the given alternatives.

Potato : Starch : : Stevia : ?

A. Milk

B. Salt

C. Sugar

D. Butter

Ans. C

Sol. Potato starch is the starch extracted from potatoes. Similarly, Stevia is a sweetener and sugar substitute derived from the leaves of the plant species.

Hence, option C is the correct answer.

51. What is the ratio of inertial mass to gravitational mass?

A. 1

B. 2

C. 1/2

D. 4

Ans. A

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Sol. \* The ratio of inertial mass to gravitational mass is 1, Because Inertial mass = gravitational mass.

\* Inertial mass is a mass parameter giving the inertial resistance to acceleration of the body when responding to all types of force.

\* Gravitational mass is determined by the strength of the gravitational force experienced by the body when in the gravitational field  $g$ .

52. The National People's Congress of China is located in which city of China?

- A. Shanghai
- B. Hangzhou
- C. Beijing
- D. Shenzhen

Ans. C

Sol. • The National People's Congress (NPC) is located in Beijing, China.

• The National People's Congress is the most massive parliamentary body in the world with 2,924 members.

• The National People's Congress (NPC) is the highest organ of state power and the national legislature of the People's Republic of China.

• The Constitution of the People's Republic of China guarantees the Communists Party as the supreme leader and political authority in the country.

53. The pigment that gives colour to human skin, hair and eyes is called \_\_\_\_\_.

- A. Phthalocyanine
- B. Melanin
- C. Quinacridone
- D. Alizarin

Ans. B

Sol. • The pigment that gives human skin, hair and eyes their colour is called Melanin.

• Dark-skinned people have more melanin in their skin than light-skinned people.

• Melanin is produced by cells called melanocytes.

54. Cold currents flow from \_\_\_\_\_ to \_\_\_\_\_.

- A. Equator to Pole
- B. Pole to Equator
- C. Random Distribution
- D. Along Equator

Ans. B

Sol. • Cold Currents flow from Pole to Equator.

• Cold currents bring cold water into warm water areas.

• They flow in the anti-clockwise direction in the northern hemisphere and in the clockwise direction in the southern hemisphere.

• Examples- Somali Current, West Australian Current, Labrador Current, California Current etc.

55. Who was not among the founders of Poona Sarvajanik Sabha?

- A. M G Ranade
- B. S H Chiplunkar
- C. Ganesh Vasudev Joshi
- D. Jaganath Shanker Seth

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Ans. D

Sol. \* Indira Gandhi was the prime minister at the time of nationalisation of 14 major commercial banks.

\* The nationalisation of 14 banks was done on 19 July 1969.

\* Indira Gandhi was elected as the first woman prime minister.

\* The largest and the oldest bank which is still in existence is the State Bank of India.

60. Which among the following former cricketers has been elected unopposed as the President of BCCI in 2019?

A. Sourav Ganguly

B. Sunil Gavaskar

C. Dilip Vengsarkar

D. Sachin Tendulkar

Ans. A

Sol. • BCCI (Board of Control for Cricket in India) is the national governing body for cricket in India, which was formed in December 1928 as a society, under the Tamil Nadu Societies Registration Act.

• Former Indian Captain Sourav Ganguli has been appointed as BCCI's 39<sup>th</sup> president.

• The head office of BCCI is situated in Mumbai at Wankhade stadium.

61. Who won the Pritzker Architecture Prize, 2019?

A. Alejandro Aravena

B. Arata Isozaki

C. B V Doshi

D. Shigeru Ban

Ans. B

Sol. • Arata Isozaki won the Pritzker Architecture Prize 2019.

• The ceremony was held on 24 May 2019. The award was constituted by Pritzker family of Chicago through their Hyatt Foundation in 1979.

• The motive of this Architecture Prize is to honor a living architect or architects whose built work demonstrates a combination of talent, vision and commitment.

62. Which of the following groups has the highest electron affinity?

A. Oxygen family

B. Halogens

C. Nitrogen group

D. Lanthanides

Ans. B

Sol. Halogens have the highest electron affinity.

• Electron affinity is basically the ability of an atom to accept an electron and gets converted into a negatively charged ion.

• Generally it increases going left to right across a period and decreases going down the group.

• Chlorine and Fluorine are the most high electron affinity atoms.

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67. Which of the following ministries has launched a webinar "Dekho Apna Desh"?

- A. Ministry of Defence
- B. Ministry of AYUSH
- C. Ministry of Tourism
- D. Ministry of Health

Ans. C

Sol. \* Ministry of Tourism has launched a webinar "Dekho Apna Desh".

\* This will be the second webinar and Its named as Calcutta – A confluence of culture.

68. In which state, maximum length of the Ganga river lies?

- A. Uttrakhand
- B. Uttar Pradesh
- C. Bihar
- D. West Bengal

Ans. B

Sol. The Ganga River flows maximum distance in Uttar Pradesh.

\* The total length of Ganga River is 2,525 kms.The distribution of Ganga flow statewise is-

- A. Uttarakhand- 110 kms
- B. Uttar Pradesh -1,450 kms
- C. Bihar- 445 kms
- D. West Bengal- 520 kms.

69. Daporijo Bridge was inaugurated in which of the following state or union territory ?

- A. Assam
- B. Ladakh
- C. Jammu & Kashmir
- D. Arunachal Pradesh

Ans. D

Sol. • Daporijo Bridge was inaugurated in Arunachal Pradesh state on 20 April 2020.

- This bridge was constructed by the Border Roads Organisation across the Subansiri River.
- The bridge over the Subansiri River in Arunachal Pradesh was constructed in less than a month.

70. Japanese Encephalitis (JE) is an infection of which body part?

- A. Kidney
- B. Immune system
- C. Bones
- D. Central Nervous System

Ans. D

Sol. • Japanese Encephalitis is an infection of the Central Nervous System caused by the Japanese encephalitis virus (JEV).

- This occurs 5 - 15 days after infection.
- It is a mosquito-borne infection that can cause fever, headache, seizures and in some cases death.
- JEV cannot transmit from one person to another.

71. Which part of the Indian Constitution deals with the citizenship provisions?

- A. Part IV
- B. Part III
- C. Part V
- D. Part II

Ans. D

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- Sol. • Articles 5 to 11 under Part II of the Constitution deals with the citizenship provisions.
- This part does not define the term 'citizen' but it only identifies the persons who became citizens of India at its commencement.
  - It empowers the Parliament to enact law to provide for such matters and any other matter relating to citizenship. Accordingly the Parliament has enacted the Citizenship Act, 1955, which has been amended many times.

72. Which court serves the purpose of resolving issues between two parties amicably by way of compromise?

- A. District Court
- B. Lok Adalat
- C. High Court
- D. None of these

Ans. B

- Sol. • Based on the alternative dispute resolution, Lok Adalat serves the purpose of resolving issues between two parties amicably by way of compromise.
- The Lok Adalat is organized by the High Court Legal Services Committee, District Legal Services Authority and Taluk Legal Services Committee.

73. By which name/ names is our country mentioned in the Constitution?

- A. Bharat Only
- B. India and Hindustan
- C. India, Bharat and Hindustan
- D. India and Bharat

Ans. D

- Sol. • The official names as set down in article 1 of the Indian constitution are: India (English) and Bharat (Hindi).
- Bharat was selected as the name of the country of India in 1950.

74. How many states of India share border with Myanmar?

- A. 5
- B. 3
- C. 2
- D. 4

Ans. D

- Sol. • The four northeast Indian states share border with Myanmar.
- These states share 1,643 km border with Myanmar.
  - These 4 states are Arunachal Pradesh, Nagaland (215 Km), Mizoram (510 Km) and Manipur (398 Km).
  - Arunachal Pradesh (520 Km) shares longest border with Myanmar.
  - Myanmar shares its border with India, China, Bangladesh, Thailand and Laos.

75. The viscosity can be considered as an internal \_\_\_\_\_ of the fluid in the motion.

- A. Friction
- B. Velocity
- C. Stress
- D. None

Ans. A

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80. The quintessence of Gandhian thought is:
- |                 |                |
|-----------------|----------------|
| A. Satyagraha   | B. metaphysics |
| C. spiritualism | D. moksha      |

Ans. A

Sol. According to Stanley E. Jones, Satyagraha is the totality or quintessence of Gandhian thought.

Gandhi introduced a new idea to the world - the philosophy of devotion to truth, remaining firm on the truth and resisting untruth actively but nonviolently. This is the meaning of Satyagraha, the basis of Gandhian thought.

81. Which was the first country to print books?
- |              |          |
|--------------|----------|
| A. India     | B. Japan |
| C. Indonesia | D. China |

Ans. D

Sol. • Like paper, the Chinese also invented the art of printing.  
• They used to dig wood pieces, letters, words and designs.  
• He used pieces of wood, letters, words and designs.  
• By 1430, the printing of books had begun in Europe.

82. The book 'The Glass Palace' is written by \_\_\_\_\_.
- |                 |                |
|-----------------|----------------|
| A. Amitav Ghosh | B. Anita Desai |
| C. Kiran Desai  | D. None        |

Ans. A

Sol. • The book 'the Glass Palace' is written by Amitav Ghosh.  
• The novel is set in Burma, Bengal, India, and Malaya and give information about British invasion and fall of Konbaung Dynasty in Mandalay.

83. When is Indian Coast Guard Day celebrated?
- |               |                |
|---------------|----------------|
| A. 5 February | B. 1 February  |
| C. 8 February | D. 12 February |

Ans. B

Sol. • Indian Coast Guard Day is celebrated every year on 1 February in India.  
• The Indian Coast Guard was formally established on 18 August 1978 by the Coast Guard Act, 1978 of the Parliament of India as an independent Armed force of India.  
• The Interim Indian Coast Guard was established on 1 February 1977 to prevent smuggling of sea freight.  
• It operates under the Ministry of Defence.

84. Who wrote the book 'India Divided'?
- |                    |                    |
|--------------------|--------------------|
| A. VD Savarkar     | B. MK Gandhi       |
| C. Dinbandhu Mitra | D. Rajendra Prasad |

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89. Who won the "World Game Athlete of the Year, 2019"?
- A. Rani Rampal  
B. Bajrang Punia  
C. Hima Das  
D. Dutee Chand

Ans. A

- Sol. • Rani Rampal won the "World Game Athlete of the Year, 2019".
- She was the first hockey player in the world to receive this title and she is also called Queen of Indian Hockey.
  - The award is given to a player who is outstanding in terms of social concern, performance and good behavior.

90. Which hormone is also known as growth hormone?
- A. Thyroid stimulating Hormone  
B. Somatotropic Hormone  
C. Gonade Tropic Hormone  
D. Antidiuretic Hormone

Ans. B

- Sol. • STH (Somatotropic Hormone) is also known as growth hormone.
- It stimulates growth, cell regeneration and cell reproduction.
  - GH (Growth Hormone) also stimulates production of IGF – 1 and increases the concentration of glucose and free fatty acids.

91. Which International Organization has launched the Global Research Forum against Coronavirus outbreak?
- A. European Union  
B. World Bank  
C. UNICEF  
D. WHO

Ans. D

- Sol. • World Health Organization (WHO) has launched the Global Research Forum against Coronavirus outbreak.
- A two-day global research and innovation forum was launched on February 12, 2020.
  - The forum was organized by WHO along with Global Research Collaboration for Infectious Disease Preparedness.
  - This forum has been funded by the Bill & Melinda Gates Foundation.

92. What is the total momentum of the bullet and the gun before firing?
- A. 0 metres/sec  
B. 0.5 metres/sec  
C. 1 metres/sec  
D. 2 metres/sec

Ans. A

- Sol. • The gun and the bullet are both at rest, so the momenta (mv) of the gun and the bullet are both zero.
- So, the total momentum of the system before the bullet is fired is zero.

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93. Which of the following is appointed as secretary to the President of India ?

- A. Ajay Bhadoo
- B. Kapil Dev Tripathi
- C. Sanjay Kothari Singh
- D. Randhir Kumar Jaiswal

Ans. B

Sol. • Kapil Dev Tripathi is appointed as secretary to the President of India.

- He is at present the chairman of the Public Enterprises Selection Board.
- He is appointed secretary by the Appointments Committee of the cabinet headed by Prime Minister Narendra Modi.

94. A nuclear reactor works through \_\_\_\_\_?

- A. Uncontrolled chain reaction
- B. Controlled chain reaction
- C. Nuclear fusion
- D. Spontaneous fission

Ans. B

Sol. • A nuclear reactor works through controlled chain reaction.

- A controlled chain reaction prevents the chain reaction from becoming violent.
- A nuclear reactor is a powerful device wherein produced nuclear energy is utilized.

95. India's first mission to moon was launched in which year?

- A. 2008
- B. 1998
- C. 1969
- D. 2005

Ans. A

Sol. • Chandrayaan-1 was India's first mission to the moon.

- It was launched by the Indian Space Research Organisation (ISRO) in October 2008.
- This mission was launched on 22<sup>nd</sup> October 2008 from Satish Dhawan Space Centre, at Sriharikota.
- It reached the moon on 8<sup>th</sup> November, 2008.

96. Kalsubai peak is in which of the following mountain ranges?

- A. Western Ghats
- B. Eastern Ghats
- C. Himalayas
- D. Aravalli

Ans. A

Sol. • Kalsubai peak is in Western Ghats Range.

- It is the highest peak of Maharashtra.
- It is 1646 mt high and consists mainly basaltic rock.
- Kalsubai Temple is located on this peak.

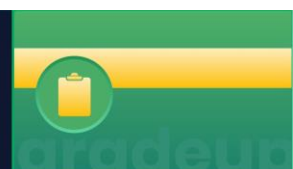
97. The Third Round Table Conference was held in the year \_\_\_\_\_.

- A. 1932
- B. 1931
- C. 1933
- D. 1930

Ans. A

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Sol. • From 1930-32 there were three Round Table Conferences were held by British to negotiate with Indian leaders-

- First Round Table Conference -1930

58 political leaders participated but Indian National Congress did not participate.

- Second Round Table Conference- Setp-Dec, 1931

Indian National Congress participated only in this conference.

Other leaders who attended - BR Ambedkar, Jinnah, Sarojini Naidu, Princely states etc.

- Third Round Table Conference – Nov-Dec, 1932

Only 46 delegates attended it, no fruitful outcomes came out of it.

98. Thermite reactions use ..... as reducing agent?

- A. Iron Oxide
- B. Aluminium powder
- C. Silver chloride
- D. Zinc powder

Ans. B

Sol. Thermite reactions use Aluminium powder as a reducing agent.

- The reduction of a metal oxide to form metal by using aluminium powder as a reducing agent is called a thermite reaction.
- Thermite reactions are exothermic reactions.
- Production of Iron by reaction of iron oxide and aluminium powder is best ex. Of thermite reaction.

99. G20 is to be held in 2020 in\_\_\_\_\_.

- A. New Delhi
- B. Tokyo
- C. Beijing
- D. Riyadh

Ans. D

Sol. • G20 is to be held in 2020 in Riyadh.

- It will be the fifteen meeting of G20 which will be held on 21–22 November 2020.
- Saudi Arabia's first participation in the G20 meetings was in 2008.
- Riyadh is the capital of South Arabia.

100. A biofortified variety of carrot called "Madhuban" Gajar has been developed by scientists of which of the following states ?

- A. Punjab
- B. Gujarat
- C. Maharashtra
- D. Karnataka

Ans. B

Sol. • The farmer scientist from Gujarat has developed a biofortified variety of carrot called "Madhuban Gajar".

- This variety of carrot has high  $\beta$ -carotene and iron content.
- The name of farmer scientist is Shri Vallabhai Vashrambhai Marvaniyawas and he was also awarded with a National Award by the President of India.

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101. In synchronous machines, the airgap is in the order of
- A. 1 – 1.5 cm
  - B. 2 – 2.5 cm
  - C. 3 – 3.5 cm
  - D. 1.5 – 2 cm

Ans. A

Sol. In synchronous machines, the small gap between the rotor and the stator is known as airgap and it is usually of the order of 1 to 1.5 cm.

102. The rating of the circuit breaker depends on
- A. Rated short circuit breaking current
  - B. Rated short circuit making current
  - C. Rated operating sequence of circuit breaker
  - D. All of the above

Ans. D

- Sol. The rating of the circuit breaker depends on
1. Rated short circuit breaking current.
  2. Rated short circuit making current.
  3. Rated operating sequence of circuit breaker.
  4. Rated short time current.

103. In Induction heating, the current induced in the charge depends on
- A. Magnitude of primary current
  - B. Turn ratio of transformer used
  - C. Co-efficient of magnetic coupling
  - D. All of the above

Ans. D

Sol. Induction heating is a heating process makes use of the currents induced by the electromagnetic action in the charge to be heated. In fact, induction heating is based on the principle of transformer working. The primary winding which is supplied from an AC source is magnetically coupled to the charge which acts as a short circuited secondary of single turn. When an AC voltage is applied to the primary, it induces voltage in the secondary i.e. charge. The secondary current heats up the charge in the same way as any electric current does while passing through a resistance. If  $V$  is the voltage induced in the charge and  $R$  is the charge resistance, then heat produced is  $V^2/R$ . The value of current induced in the charge depends on magnitude of the primary current, turn ratio of the transformer, and co-efficient of magnetic coupling.

104. The depth of the material up to which the eddy current loss penetrates due to high frequency eddy current heating depends on
- A. Resistivity of the molten metal
  - B. Supply frequency
  - C. Relative permeability of the charge
  - D. All of the above

Ans. D

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Sol. The depth of the material up to which the eddy current loss penetrates is given by

$$d = \frac{1}{2\pi} \sqrt{\frac{\rho \times 10^9}{\mu_r \times f}}$$

Where,  $\rho$  = resistivity of the molten metal

$f$  = supply frequency

$\mu_r$  = relative permeability of the charge

105. Which of the following is not a limitation of Merz Price protection method.

- A. The C T.s used must match accurately.
- B. The pilot wires must be healthy without discontinuity.
- C. It provides instantaneous protection to ground faults.
- D. Economically not suitable as cost is high due to long pilot wires.

Ans. C

Sol. The advantages of the Merz price protection scheme are as follows:

- 1. It can be used for parallel as well as ring main system.
- 2. It provides instantaneous protection to ground faults.

The disadvantages of Merz price protection scheme are as follows:

- 1. The C.T.s used must match accurately.
- 2. The pilot wires must be healthy without discontinuity.
- 3. Economically not suitable as the cost is high due to long pilot wires.
- 4. Due to long pilot wires, capacitive effects adversely bias the operation of the relays.
- 5. The large voltage drop in the pilot wires requiring better insulation.

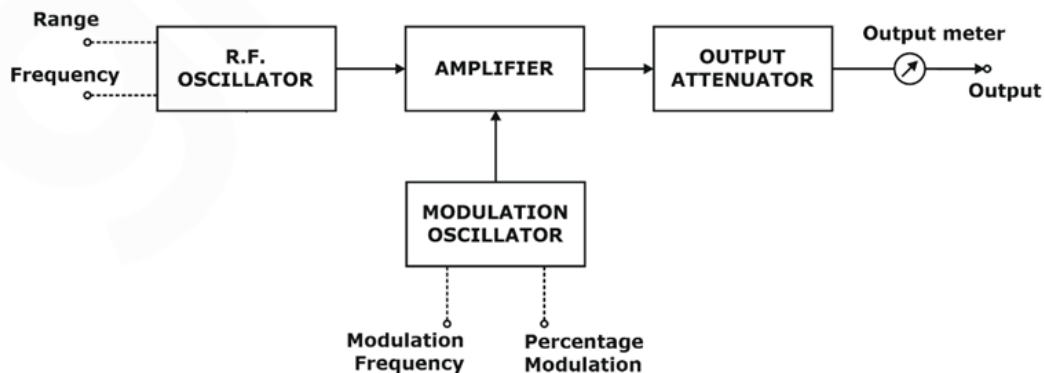
106. Which of the following component is not present in block diagram of standard signal generator?

- A. RF Oscillator
- B. Amplifier
- C. Output Attenuator
- D. Mixer

Ans. D

Sol. Standard signal generator is a source of sine wave voltage with an appreciable range of frequency and amplitude both of which are known to a high degree of accuracy.

A basic block diagram of a standard signal generator is shown below,



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107. Bulk resistance of a diode is

- A. The sum of half the resistance value of n-type and p-type material
- B. The sum of resistance value of n-type and p-type material
- C. Equivalent resistance of the resistance value of p-type and n-type material is parallel
- D. None of the above

Ans. B

Sol. Bulk resistance is offered by the diode in forward region above the barrier voltage and is the sum of the resistance value of p-type and n-type semiconductor materials.

108. Which of the following is not an advantage of using 25 kV, 50 Hz AC system in electric traction?

- A. Light overhead catenary
- B. More number of substations
- C. Simplicity of substation design
- D. Flexibility in location of substation

Ans. B

Sol. The advantages of 25 kV, 50 Hz AC system are as follows:

1. Light overhead catenary
2. Less number of substations
3. Flexibility in the location of substations
4. Simplicity of substation design
5. Lower cost of fixed installations
6. Higher coefficient of adhesion
7. Higher starting efficiency

The disadvantages of 25 kV, 50 Hz AC system are as follows:

1. Single phase ac system produces both current and voltage unbalancing effect on the supply.
2. It produces interference in telecommunication systems.

109. Which is the correct formula for calculation of pitch factor ( $K_p$ ) in the synchronous machines?

- A.  $K_p = \frac{\text{algebraic sum of the EMF's of the two coil sides}}{\text{arithmetic sum of the EMF's of the two coil sides}}$
- B.  $K_p = \frac{\text{arithmetic sum of the EMF's of the two coil sides}}{\text{phasor sum of the EMF's of the two coil sides}}$
- C.  $K_p = \frac{\text{phasor sum of the EMF's of the two coil sides}}{\text{arithmetic sum of the EMF's of the two coil sides}}$
- D.  $K_p = \frac{\text{algebraic sum of the EMF's of the two coil sides}}{\text{phasor sum of the EMF's of the two coil sides}}$

Ans. C

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Sol. The pitch factor  $K_p$  is given as

$$K_p = \frac{\text{phasor sum of the EMF's of the two coil sides}}{\text{arithmetic sum of the EMF's of the two coil sides}}$$

Or

$$K_p = \cos \frac{\beta}{2}$$

Where,  $\beta$  is  $180^\circ$  minus the number of electrical degrees spanned by the coil, for a short-pitched coil. For a full-pitched coil,  $K_p = 1$  as  $\beta = 0$ .

Or

$$K_p = \sin \frac{p^0}{2}$$

Where,  $p^0$  is the span of the coil in electrical degrees.

110. Which of the following statement is correct.

- A. The voltage between any two of the line wires in a 3-phase system is 2 times the voltage between any phase wire and the neutral.
- B. The voltage between any two of the line wires in a 3-phase system is 3 times the voltage between any phase wire and the neutral.
- C. The voltage between any two of the line wires in a 3-phase system is  $\sqrt{2}$  times the voltage between any phase wire and the neutral.
- D. The voltage between any two of the line wires in a 3-phase system is  $\sqrt{3}$  times the voltage between any phase wire and the neutral.

Ans. B

Sol. The voltage between any two of the line wires in a 3-phase system is 3 times the voltage between any phase wire and the neutral.

111. The doping of the n-type and p-type regions of the tunnel diode is of the order of

- A.  $10^9$  to  $10^{12}$  atoms/cm<sup>3</sup>
- B.  $10^3$  to  $10^6$  atoms/cm<sup>3</sup>
- C.  $10^{19}$  to  $10^{20}$  atoms/cm<sup>3</sup>
- D.  $10^{10}$  to  $10^{15}$  atoms/cm<sup>3</sup>

Ans. C

Sol. The doping of the n-type and p-type regions of the tunnel diode is of the order of  $10^{19}$  to  $10^{20}$  atoms/cm<sup>3</sup>.

112. According to torque-speed characteristics of three phase Induction motor, which of the following mode is carried, when slip lies between 1 and 2.

- A. Forward motoring mode
- B. Reverse motoring mode
- C. Braking mode
- D. Generating mode

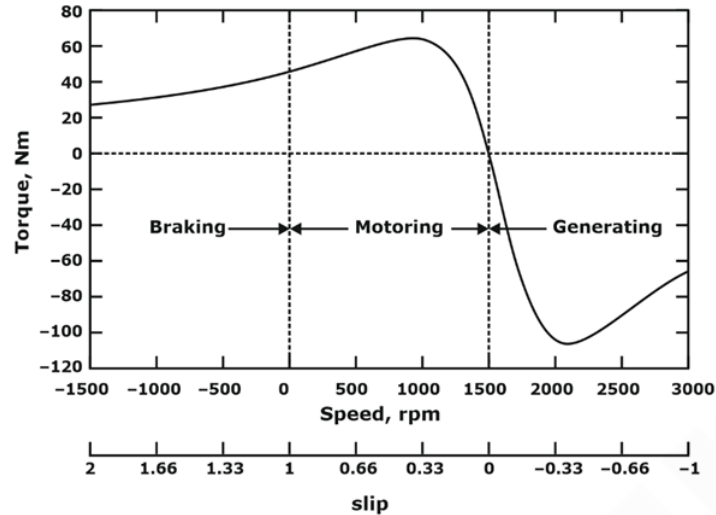
Ans. C

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Sol.



For,  $-1 < s < 0$ , the motor operates in generating mode

For,  $0 < s < 1$ , the motor operates in motoring mode

For,  $1 < s < 2$ , the motor operates in braking mode.

113. Which of the following does not lie in the category of systematic errors.

- A. Instrumental error
- B. Environment error
- C. Observational error
- D. Random error

Ans. D

Sol. There are 3 major types of errors:

1. Gross Error
2. Systematic Error:
  - a) Instrumental error
  - b) Environmental error
  - c) Observational error
3. Random Error

114. The breakdown strength or electrostatic stress in the air around the conductor when corona occurs is

- A. 21.1 kV(rms)/cm
- B. 30 kV(rms)/cm
- C. 21.1 kV(max)/cm
- D. 27.1 kV(rms)/cm

Ans. A

Sol. When an alternating potential difference is applied across two conductors whose spacing is large as compared to their diameter, there is no apparent change in the condition of the atmospheric air surrounding the wires if voltage is low. However, when the potential difference is increased, then a point is reached when a faint luminous glow of bluish colour appears along the lengths of the conductors and at the same time a hissing sound is heard. This bluish discharge is known as corona.

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When a current enters in a parallel network consisting of several values of resistance, then the smallest value of resistor in the network will have largest amount of current, which is characterised by the most of the current will follow the path of least resistance.

118. Which of the following theory explains the phenomenon of arc extinction.

- A. Energy balance theory
- B. Voltage race theory
- C. Both A and B
- D. Neither A nor B

Ans. C

Sol. The two theories which explains the phenomenon of arc extinction are as follows:

1. Energy balance theory: When the contact of circuit breaker are about to open, restriking voltage is zero, hence generated heat would be zero and when the contacts are fully open there is infinite resistance, therefore no production of heat again. If the rate of generation of heat between the contacts of circuit breaker is lower than the rate at which heat between the contact is dissipated, then the established arc shall be extinguished successfully. Thus, if it possible to remove the generated heat by cooling, lengthening, and splitting the arc at a high rate of generation, arc can be extinguished.

2. Voltage race theory: The arc is due to the ionization of the gap between the contact of the circuit breaker. Thus, the resistance at the initial stage is very small, i.e., when the contact are closed and as the contact separates the resistance starts increasing. If we remove ions at the initial stage either by recombining them into neutral molecules or inserting insulation at a rate faster than the rate of ionization, the arc can be interrupted. The ionization at zero current depends on the restriking voltage. The theory states that if the rate of rise of restriking voltage is lesser than the rate at which the dielectric strength of the medium increases, then arc will be successfully extinguished.

119. According to Stefan's Law of radiation, heat radiated by a hot body is

- A. Directly proportional to  $T^3$
- B. Inversely proportional to  $T^3$
- C. Directly proportional to  $T^4$
- D. Inversely proportional to  $T^4$

Ans. C

Sol. As per Stefan's law of radiation, heat radiated by a hot body is given as

$$H = 5.72 \left[ \left( \frac{T_1}{100} \right)^2 - \left( \frac{T_2}{100} \right)^2 \right] \text{W/m}^2$$

Hence, it is directly proportional to the  $T^4$ .

120. Which of the following is not a distance relay?

- A. IDMT relay
- B. Impedance relay
- C. Mho relay
- D. Reactance relay

Ans. A

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Sol. Distance relays are classified on depending on their operating characteristics in the R-X plane:

1. Impedance relay
2. Mho relay
3. Reactance relay

121. Pinch effect in welding is directly proportional to the

- A. Number of turns in primary of the transformer
- B. Number of turns in secondary of the transformer
- C. Current density
- D. All of the above

Ans. C

Sol. To nullify the effect of increased leakage reactance, low primary frequency of the order of 10 Hz is used. If the transformer secondary current density exceeds  $500 \text{ A/cm}^2$  then, due to the interaction of the secondary current with the alternating magnetic field, the molten metal is squeezed to the extent that secondary circuit is interrupted. This effect is known as pinch effect.

122. Which of the following is correct about the Inter-poles in DC machines?

- A. the width of the tip of the interpoles is made to be about a stator slot pitch.
- B. the width of the tip of the interpoles is made to be about a rotor slot pitch.
- C. the width of the base of the interpoles is made to be about a rotor slot pitch.
- D. the width of the base of the interpoles is made to be about a stator slot pitch.

Ans. B

Sol. Inter-poles are the small additional poles located in between the main poles. These can be solid, laminated just as the main poles. The interpoles could be tapered section or of uniform cross-section. These are also called commutating poles or compoles. The width of the tip of the compoles can be about a rotor slot pitch.

123. Zener effect is defined as

- A. electron tunnelling from the n-type conduction band to the p-type valence band produces a reverse current.
- B. electron tunnelling from the n-type valence band to the p-type conduction band produces a reverse current.
- C. electron tunnelling from the p-type conduction band to the n-type valence band produces a reverse current.
- D. electron tunnelling from the p-type valence band to the n-type conduction band produces a reverse current.

Ans. D

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Sol. When a reverse bias is increased, the valance band of the p-side slowly moves up over the conduction band of the n-side and the tunnelling probability increases as the number of filled states of the p-side moves up over n-side. Electron tunnelling from the p-type valance band to the n-type conduction band produces a reverse current known as the Zener effect.

124. Which of the following statement is true regarding magnetization characteristics?

- A. Current on X-axis and flux on Y-axis
- B. Flux on X-axis and current on Y-axis
- C. Magnetic field strength on X-axis and magnetic flux density on Y-axis
- D. None of the above

Ans. A

Sol. The BH curve is drawn with current on X-axis and the flux on Y-axis is called magnetization characteristics.

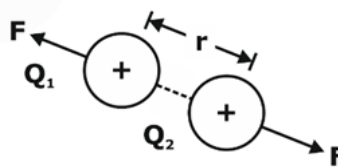
According to the relation,  $B \propto \phi$ ,  $H \propto i$

125. Coulomb's Law depicts that

- A. electrons in outer orbits are less strongly attracted to the nucleus than those in inner orbits
- B. electrons in inner orbits are less strongly attracted to the nucleus than those in outer orbits
- C. none of the electrons in an atom participate in coulomb force
- D. electrons in the outer orbit cannot escape from their parent atoms

Ans. A

Sol. Coulomb's Law states that the force between charges which was studied by French scientist Charles coulomb, which is given as the force between two charges  $Q_1$  and  $Q_2$  is directly proportional to the product of their charges and inversely proportional to the square of the distance between them.



Mathematically, it is given as

$$F = \frac{kQ_1Q_2}{r^2} \quad [\text{newotons, N}]$$

Because of this relationship, electrons in outer orbits are less strongly attracted to the nucleus than those in inner orbits, i.e., they are less tightly bounded to the nucleus than those close by. Valence electrons are the least tightly bound and if require a sufficient energy can escape from their parent atoms.

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126. The type of material used for manufacturing of earth wires is
- A. Copper
  - B. Galvanized iron
  - C. Aluminium
  - D. All of the above

Ans. D

Sol. All earth wires and earth continuity conductors should be of copper, galvanized iron or steel, or aluminium.

127. Ampere circuital law is analogous to
- A. Kirchhoff's current law
  - B. Kirchhoff's voltage law
  - C. Coulomb's law
  - D. Faraday's law

Ans. B

Sol. Ampere's circuital law states that algebraic sum of the rises and drops of the mmf around a closed path of a magnetic circuit is equal to zero i.e. the sum of the rises in mmf equals the sum of the drop in mmf around a closed loop. Here, algebraic means addition or subtraction depending on the direction of the flux and nature of the coil wound.

Mathematically, it is expressed as

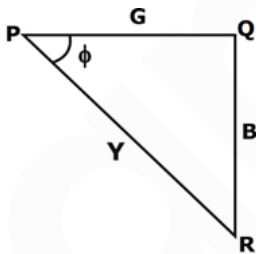
$$\sum_{\text{loop}} NI = \sum_{\text{loop}} HI$$

It states that the applied mmf  $NI$  is equal to the sum of the drops  $HI$  around the loop.

128. According to the admittance triangle, which of the following is not true (symbols having their usual meanings).
- A.  $\cos \phi = \frac{G}{Y}$
  - B.  $\cos \phi = \frac{B}{Y}$
  - C.  $\sin \phi = \frac{B}{Y}$
  - D.  $Y = \sqrt{G^2 + B^2}$

Ans. B

Sol. According to the admittance triangle,



$$Y = \sqrt{G^2 + B^2}$$

$$\cos \phi = \frac{G}{Y}$$

$$\sin \phi = \frac{B}{Y}$$

Note: The inductive susceptance is regarded as negative and capacitive susceptance is regarded as positive.

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129. Which of the following condition is not true about the self-excitation of DC generator?
- A. Residual field must be present.
  - B. The polarity of excitation must aid the residual magnetism.
  - C. The field circuit resistance must be below the critical value.
  - D. The speed of operation of the machine must be below the critical speed.

Ans. D

Sol. The conditions for self-excitation is as follows:

- 1) Residual field must be present.
- 2) The polarity of excitation must aid the residual magnetism.
- 3) The field circuit resistance must be below the critical value.
- 4) The speed of operation of the machine must be above the critical value.
- 5) The load resistance must be very large.

130. Consider a neutral body, now  $1.7 \mu\text{C}$  of negative charge is removed for the body. Later on,  $18.7 \times 10^{11}$  electrons are added. Find the final charge on the body?
- A.  $+1 \mu\text{C}$
  - B.  $+1.4 \mu\text{C}$
  - C.  $-1.4 \mu\text{C}$
  - D.  $-1 \mu\text{C}$

Ans. B

Sol. Initially, the body is neutral i.e.,  $Q_{\text{initial}} = 0 \text{ C}$

When  $1.7 \mu\text{C}$  of electrons i.e., negative charge is removed, the body is left with a positive charge of  $1.7 \mu\text{C}$ .

Now,  $18.7 \times 10^{11}$  electrons are added to the body, which is equivalent to

$$18.7 \times 10^{11} \text{ electrons} \times \frac{1 \text{ coulomb}}{6.24 \times 10^{18} \text{ electrons}} = 0.3 \mu\text{C}$$

$0.3 \mu\text{C}$  of negative charge is added to the body.

Hence, the final charge on the body is therefore,

$$Q_f = 1.7 \mu\text{C} - 0.3 \mu\text{C} = +1.4 \mu\text{C}$$

131. Which of the following statement is not true about PMMC (permanent magnet moving coil) type instruments?
- A. Friction and temperature error are present.
  - B. Error is produced due to ageing effect.
  - C. Torque to weight ratio is low.
  - D. Scale is uniform.

Ans. C

Sol. Following are the points regarding PMMC type instruments:

1. PMMC type instruments can only be used for DC measurements.
2. Error in PMMC type instruments occurs due to ageing effect.
3. Range of the PMMC type instruments can be extended.

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4. Torque to weight ratio is high.
5. Scale is uniform.
6. Power consumption is less in PMMC type instruments.
7. The effect of stray field is negligible because operating magnetic field is very strong.
8. Friction and temperature error are present.

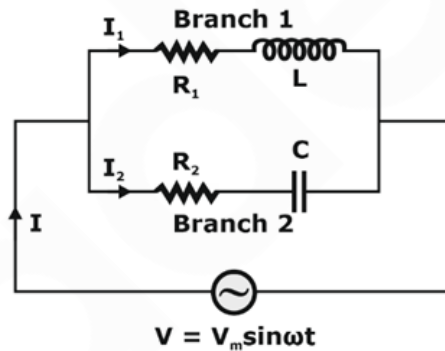
132. What is the main difference between Tungsten inert-gas welding (TIG) and Metal inert-gas welding (MIG)?

- A. Both are same process i.e., TIG is sometimes referred as MIG
- B. TIG uses bare consumable wire whereas MIG uses bare non-consumable wire
- C. TIG uses bare non-consumable wire whereas MIG uses bare consumable wire
- D. None of the above

Ans. C

Sol. Tungsten inert-gas (TIG) process is a electric process which uses a bare non-consumable tungsten electrode for striking the arc and filler wire is added separately, whereas Metal inert-gas (MIG) process is a refinement of TIG process, which uses a bare consumable wire electrode which as filler material also.

133. Consider a parallel circuit as shown in figure below,



Let  $\phi_1$  and  $\phi_2$  be the magnitude of impedance angle of branch 1 and 2 respectively & given that  $C \gg L$ . Then which of the following relation is true.

- A.  $\phi_1 = \phi_2$
- B.  $\phi_1 > \phi_2$
- C.  $\phi_1 < \phi_2$
- D. cannot be determined

Ans. B

Sol. For branch 1:

$$Z_1 = \sqrt{R_1^2 + X_L^2} \angle + \tan^{-1} \left( \frac{X_L}{R} \right)$$

For branch 2:

$$Z_2 = \sqrt{R_2^2 + X_C^2} \angle - \tan^{-1} \left( \frac{X_C}{R} \right)$$

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Comparing the magnitude of impedance angle,

$$\phi_1 = \tan^{-1}\left(\frac{X_L}{R}\right) = \tan^{-1}\left(\frac{\omega L}{R}\right)$$

$$\Rightarrow \tan \phi_1 = \frac{\omega L}{R}$$

$$\phi_2 = \tan^{-1}\left(\frac{X_C}{R}\right) = \tan^{-1}\left(\frac{1}{\omega RC}\right)$$

$$\Rightarrow \tan \phi_2 = \frac{1}{\omega RC}$$

Since,  $C \gg L$ , therefore,

$$\frac{1}{\omega RC} \ll \frac{\omega L}{R}$$

Hence,

$$\tan \phi_2 \ll \tan \phi_1$$

$$\Rightarrow \phi_2 < \phi_1$$

134. Which of the following condition is not true regarding balanced condition of AC Bridges?

A.  $\bar{I}_1 = \bar{I}_3, \bar{I}_2 = \bar{I}_4$

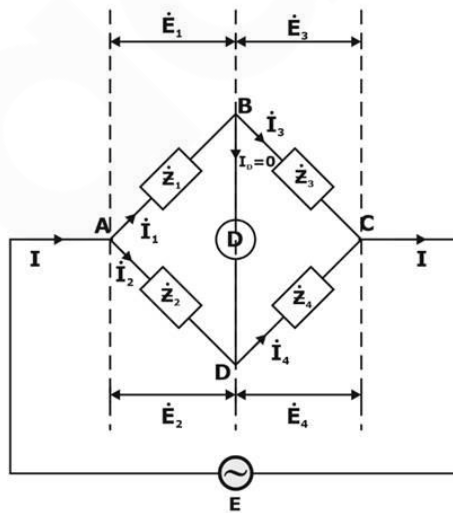
B.  $|Z_1||Z_4| = |Z_2||Z_3|$

C.  $\theta_1 + \theta_4 = \theta_2 + \theta_3$

D.  $\bar{E}_1 = \bar{E}_3, \bar{E}_2 = \bar{E}_4$

Ans. D

Sol. The General form of AC Bridge is given as



At the balance condition, the current through detector is zero.

$$\bar{I}_1 = \bar{I}_3,$$

$$\bar{I}_2 = \bar{I}_4$$

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At balance condition,

Voltage drop across AB = voltage drop across AD

$$\overline{E}_1 = \overline{E}_2,$$

similarly, voltage drop across BC = voltage drop across DC

$$\overline{E}_3 = \overline{E}_4$$

Combining all equations, we get, product of impedances of opposite arms are equal, i.e.,

$$|Z_1| \angle \theta_1 |Z_4| \angle \theta_4 = |Z_2| \angle \theta_2 |Z_3| \angle \theta_3$$

$$|Z_1| |Z_4| \angle \theta_1 + \theta_4 = |Z_2| |Z_3| \angle \theta_2 + \theta_3$$

$$\therefore |Z_1| |Z_4| = |Z_2| |Z_3|$$

$$\theta_1 + \theta_4 = \theta_2 + \theta_3$$

135. In a forward-biased photo diode, with increase in incident light intensity, the diode current
- A. Increases
  - B. Remains constant
  - C. Decreases
  - D. None of the above

Ans. C

Sol. In a forward biased photodiode, with increase in incident light intensity, the diode current decreases, as with increase in incident light intensity, the optical generation rate will increase, which in turn decreases the net diode current.

136. The condition of operation of synchronous condenser is given by

A.  $\frac{|E_f|}{|V_T|} < 1$

B.  $\frac{|E_f|}{|V_T|} = 1$

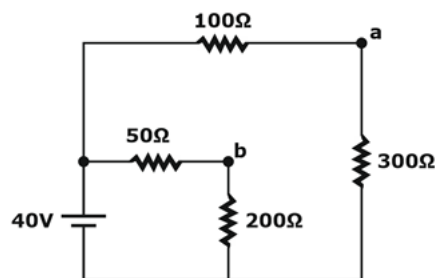
C.  $\frac{|E_f|}{|V_T|} > 1$

D. None of the above

Ans. C

Sol. Excitation greater than normal is called over excitation and excitation less than normal is under excitation. When the machine is operating in overexcited mode,  $|E_f| > |V_T|$ . In fact, a synchronous motor operating under over excitation condition is called as synchronous condenser.

137. Find the voltage  $V_{ab}$  for the circuit shown below,



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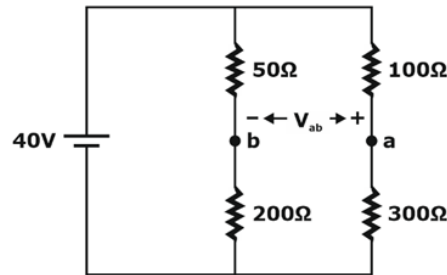
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- A. +2 V
- B. -2 V
- C. +4 V
- D. -4 V

Ans. B

Sol. Redrawing the circuit for more simple representation as shown in figure below,



Now, applying voltage division rule, for both branches,

$$V_b = \frac{200}{200 + 50} \times 40 = \frac{200}{250} \times 40 = \frac{4}{5} \times 40 = 32 \text{ V}$$

$$V_a = \frac{300}{300 + 100} \times 40 = \frac{300}{400} \times 40 = \frac{3}{4} \times 40 = 30 \text{ V}$$

$$\text{Therefore, } V_{ab} = V_a - V_b = 30 - 32 = -2 \text{ V}$$

138. Calculate the barrier potential for a Si junction diode at 0°C if its value at 25°C is 0.7 V.

- A. 0.65 V
- B. 0.7 V
- C. 0.75 V
- D. 0.9 V

Ans. C

Sol. Given that:  $T_1 = 0^\circ\text{C}$  and  $T_2 = 25^\circ\text{C}$

We know that,

$$\Delta V = -0.002\Delta T$$

$$= -0.002(T_2 - T_1)$$

$$= -0.002(0 - 25) = 0.05 \text{ V}$$

The barrier potential at 0°C is

$$V_B = 0.7 + 0.05 = 0.75 \text{ V}$$

139. Which of the following is correct in regard to copper saving in autotransformer as compared to two winding transformer (symbols having their usual meanings)?

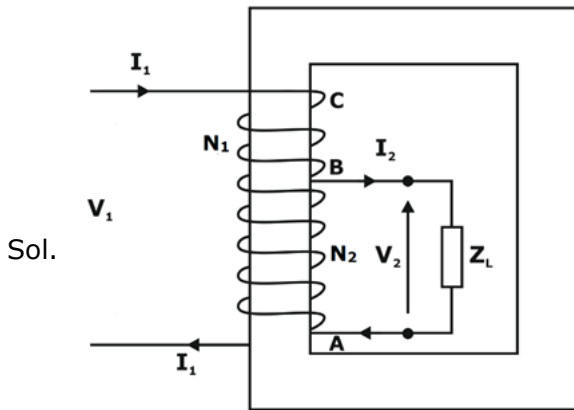
- A.  $\frac{\text{copper in auto transformer}}{\text{copper in two winding transformer}} = 1 - \frac{N_1}{N_2}$
- B.  $\frac{\text{copper in two winding transformer}}{\text{copper in auto transformer}} = 1 - \frac{N_2}{N_1}$
- C.  $\frac{\text{copper in auto transformer}}{\text{copper in two winding transformer}} = 1 - \frac{N_2}{N_1}$
- D.  $\frac{\text{copper in two winding transformer}}{\text{copper in auto transformer}} = 1 - \frac{N_1}{N_2}$

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Ans. C



To quantify the saving of copper, the total quantity of copper used in an auto transformer is expressed as a fraction of that used in a two winding transformer as,

$$\frac{\text{copper in auto transformer}}{\text{copper in two winding transformer}} = \frac{(N_1 - N_2)I_1 + N_2(I_2 - I_1)}{N_1I_1 + N_2I_2}$$

$$= 1 - \frac{2N_2I_1}{N_1I_1 + N_2I_2}$$

$$= 1 - \frac{2N_2I_1}{2N_1I_1} \quad [\because N_1I_1 = N_2I_2]$$

$$= 1 - \frac{N_2}{N_1}$$

140. According to which Indian Electricity Rule No., earth wire is also provided which stipulates that "the supplier has to provide & maintain a protection of appliances at the consumer end".

- A. Indian Electricity Rule No. 23
- B. Indian Electricity Rule No. 30
- C. Indian Electricity Rule No. 33
- D. Indian Electricity Rule No. 37

Ans. C

Sol. In addition to the four wires, i.e., R, Y, B and N, a fifth wire is also provided. The fifth wire, is called the earth wire and is denoted by E, originates from a solidly earthed point at the sub-station because of the Indian Electricity Rule No. 33 which stipulates that the supplier shall provide and maintain on the consumers' and premises for the consumers to use suitable earth terminal.

141. What is the value of series resistance to be used to extent (0 – 200) V range of 20,000 Ω/volt voltmeter to (0 - 2000) V.

- A. 18 Kω
- B. 36 kΩ
- C. 18 MΩ
- D. 36 MΩ

Ans. D

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Sol.  $V_{se} = V - V' = 2000 - 200 = 1800 \text{ V}$

$$I_{FSD} = 1/\text{sensitivity} = 1/20,000$$

$$V_{se} = R_{se} \times I_{FSD}$$

$$R_{se} = 1800 \times 20,000 = 36 \text{ M}\Omega$$

142. According to the Thumb rule in overhead lines, which of the following statement is true?

- A. The depth of the pole to be planted in the ground is taken as  $1/4^{\text{th}}$  of the pole length.
- B. The depth of the pole to be planted in the ground is taken as  $1/2^{\text{nd}}$  of the pole length.
- C. The depth of the pole to be planted in the ground is taken as  $1/8^{\text{th}}$  of the pole length.
- D. The depth of the pole to be planted in the ground is taken as  $1/6^{\text{th}}$  of the pole length.

Ans. D

Sol. Poles are used as supports for crossarms, insulators, and conductors for overhead lines.

The different types of poles used for erecting overhead lines in urban and rural areas are:

- 1. Wooden poles
- 2. Steel poles
- 3. Re-enforced cement concrete (RCC) poles

As a thumb rule, the depth of the pole to be planted in the ground is taken as  $1/6^{\text{th}}$  of the pole length. Generally, PCC poles are used of the length of around 8 – 9 m because they are lighter, transportation handling, erection are easier.

143. When an alternating potential difference is applied across a transmission line, it draws a leading current even when it is unloaded. This leading current is in quadrature with the applied voltage and is known as

- A. Displacement current
- B. Leakage current
- C. Charging current
- D. Discharging current

Ans. C

Sol. When an alternating potential difference is applied across a transmission line, it draws a leading current even when it is unloaded. This leading current is in quadrature with the applied voltage and is known as charging current. Its value depends upon voltage, the capacitance of the line and the frequency of the alternating current.

144. Which of the following statement is correct in regard to Electrostatic Instruments.

- A. Both frequency and hysteresis error is present.
- B. Power consumption is very high.
- C. Scale is non-uniform.
- D. It can only be used for AC measurements.

Ans. C

Sol. Following are the points in regard to Electrostatic instruments:

- 1. It is used in both AC and DC.
- 2. There is no frequency error.

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3. There is no hysteresis error.
4. There is no stray magnetic field error.
5. It is used for high voltage.
6. Power consumption is negligible.
7. Scale is not uniform.
8. Larger in size.
9. Cost is more.

145. Which of the following requirement about the type of material used in transformer core?

- |                                |                              |
|--------------------------------|------------------------------|
| A. Low Remanence               | B. Low Permeability          |
| C. Low saturation flux density | D. Large area under B-H loop |

Ans. A

Sol. Transformer core for the power frequency application is made of highly permeable material. The high value of permeability helps to give a low reluctance for the path of the flux and the flux lines mostly confine themselves to the iron. The magnetic material is required to have a high permeability and high saturation flux density, a very low remanence, and a small area under the B-H loop to permit high flux density of operation with low magnetizing current and low hysteresis loss.

146. Which of the following relation is correct, where A.U. represents astronomical unit?

- |                          |                           |
|--------------------------|---------------------------|
| A. 1                     |                           |
| A. U. = $10^{-10}$ cm    | B. 1 A.U. = $10^{-8}$ cm  |
| C. 1 A.U. = $10^{-9}$ cm | D. 1 A.U. = $10^{-12}$ cm |

Ans. C

Sol.  $1 \text{ A.U.} = 10^{-8} \text{ cm} = 10^{-10} \text{ m}$

147. In early effect, when  $V_{CB}$  increases,

- A. the emitter current will decrease.
- B. the emitter current will increase.
- C. the emitter current will remain the same.
- D. None of the above

Ans. B

Sol. When  $V_{CB}$  increases, the depletion region in the collector-base junction widens and reduces the base width. This is known as Early effect. As a result of this effect, the gradient of the injected hole in the base region increases. The injected hole current across the emitter junction is proportional to the gradient of the hole concentration. So, an increase in the emitter current with an increase in  $V_{CB}$  is obtained. Since, the collector is also dependent on the emitter current, the collector current also increase.

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148. For the economic conditions, Buchholz relay is provided in the transformer having rating
- A. Below 500 KVA
  - B. Above 500 KVA
  - C. Below 250 KVA
  - D. Above 250 KVA

Ans. B

Sol. For the economic conditions, Buchholz relay are not provided in the transformer having rating below 500 KVA.

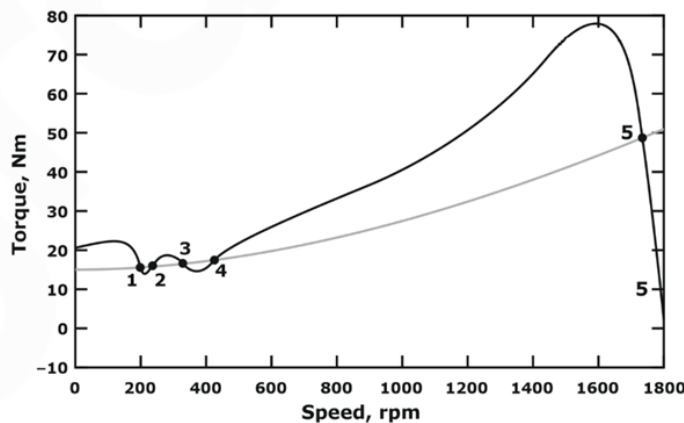
149. Which of the following type of magnet is not used in manufacturing of permanent magnet machines?
- A. Neodymium-iron-boron magnets
  - B. Alnico magnets
  - C. Samarium cobalt magnets
  - D. Non-ceramic magnets

Ans. D

Sol. Permanent magnet machines uses below following magnets:

1. Alnico magnets: Alnico magnets are metallic alloys of aluminium, nickel, cobalt, and iron. Alnico magnets are generally, characterized by relatively high residual flux density and relatively low coercive force.
2. Ceramic magnets: Ceramic magnets contains ferrite oxide of barium or strontium and exhibit the property of ferromagnetism. Ceramic materials are characterized by relatively low residual flux density and relatively high coercive force.
3. Samarium magnets: sometimes called samarium cobalt magnets. The residual flux density in samarium magnets is 3 to 5 times that of ceramic magnets.
4. Neodymium-iron-boron magnets: It is often known as (NFeB) magnets. It has highest coercive force among all the commercial magnets with highest residual flux density.

150. Which of the following point is unstable in the below graph of effect of harmonics on loaded three phase induction machine?



- A. Point 1
- B. Point 2
- C. Point 3
- D. Point 4

Ans. B

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Sol. Point 1 is stable and hence, the machine would have a tendency to operate there, though the intended operating point might be point 5. This tendency is referred to as crawling. A momentary reduction in load torque conditions might accelerate the machine to point 2, which is unstable. The operating point would then settle down at point 3.

151. The unit of Luminance or Brightness is

- A. Lumen
- B. Candela
- C.  $\text{Lm/m}^2$
- D.  $\text{Cd/m}^2$

Ans. D

Sol. The unit of Luminous flux is Lumen.

The unit of Luminous Intensity is Candela.

The unit of Illumination or Illuminance is  $\text{Lm/m}^2$  or Lux.

The unit of Luminance or Brightness is  $\text{Cd/m}^2$ .

152. For a junction FET in the pinch off region, as the drain voltage is increased, the drain current

- A. Becomes zero
- B. Abruptly decreases.
- C. Abruptly increases
- D. Remains constant

Ans. D

Sol. For a junction FET in the pitch off region, as the drain voltage increases, the drain current remains constant.

153. A conductor of length 0.5 m is placed in a magnetic field of strength  $0.5 \text{ Wb/m}^2$ . Calculate the induced emf when a current of 50 A flow through it and conductor is moving at a velocity of 20 m/sec.

- A. 5 V
- B. 2.5 V
- C. 10 V
- D. 7.5 V

Ans. A

Sol. Induced emf in a conductor moving in a magnetic field is given as

$$e = BvL \text{ volts}$$

$$e = 0.5 \times 0.5 \times 20$$

$$e = 5 \text{ Wb/sec} = 5 \text{ V}$$

154. Which of the following is the not a design of Bourdon tube, which is used to measure pressure?

- A. Twisted tube
- B. Helical tube
- C. Spiral tube
- D. S-type tube

Ans. D

Sol. Bourdon Tubes are designed in various forms like:

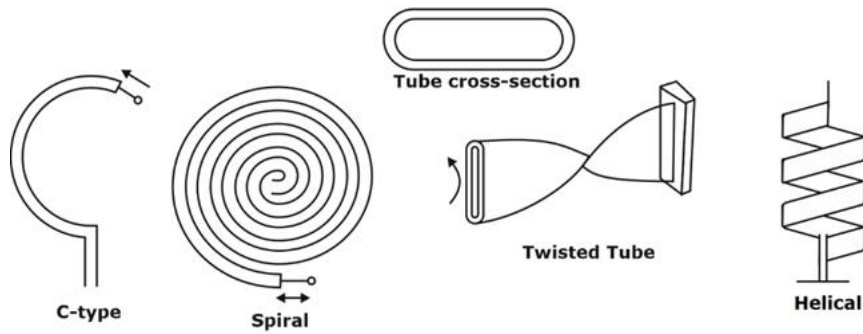
- 1) C type tube
- 2) Spiral type tube
- 3) Twisted type tube
- 4) Helical type tube

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155. In cleat wiring, the cleats are fixed at a regular intervals not exceeding the value of
- A. 1 m
  - B. 0.6 m
  - C. 2 m
  - D. 2.5 m

Ans. B

Sol. In cleat wiring, the cables are run over cleats. The cleats are made of porcelain. Cleats are fixed at regular intervals not exceeding 0.6 m. The wire used for cleat wiring should be vulcanized rubber insulated cable, PVC cable, or any other approved insulated cable.

156. The threshold voltage of an n-channel MOSFET can be increased by
- A. Increasing the channel dopant concentration
  - B. Reducing the channel length
  - C. Reducing the gate oxide thickness
  - D. Reducing the channel dopant concentration

Ans. A

Sol. The threshold voltage of n-channel MOSFET can be increased by reducing the channel dopant concentration or by increasing the oxide thickness.

157. Which device is used to reduce the steepness of the wave front of a particular surge in the transmission lines?
- A. Surge diverter
  - B. Lighting arrester
  - C. Surge absorber
  - D. All of the above

Ans. C

Sol. Surge absorber is a device which is used to reduce the steepness of the wave front of a particular surge & thus minimizes the danger due to overvoltage's.

Note:

Surge Diverter: diverts the surge to earth

Surge Absorber: absorbs the surge energy

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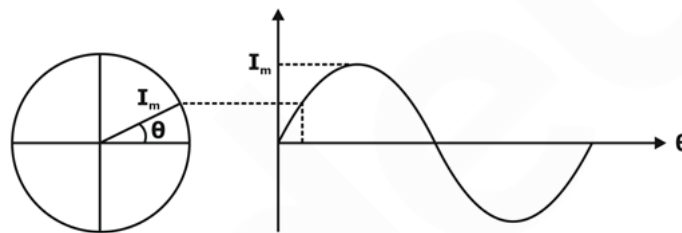
158. Which of the following condition regarding the representation of alternating sinusoidal rotating phasor is not true?

- A. The rotating phasor should be equal to the peak value of the quantity.
- B. The rotating phasor should initially start at zero and moves in counter clockwise direction.
- C. The speed of the rotating phasor must complete one cycle.
- D. The rotating phasor should start at zero and moves in clockwise direction.

Ans. D

Sol. For any alternating sinusoidal quantity, the condition for rotating phasor to be represented are as follows:

1. The rotating phasor should be equal to the peak value of the quantity.
2. The rotating phasor should initially start at zero and moves in counter clockwise direction.
3. The speed of the rotating phasor must complete one cycle.



159. Which of the following is the n-type doping element?

- A. Ga
- B. In
- C. Al
- D. Sb

Ans. D

Sol. The commonly used n-type dopants are as follows:

1. Phosphorous (P)
2. Antimony (Sb)
3. Arsenic (As)

The commonly used p-type dopants are as follows:

1. Boron (B)
2. Gallium (Ga)
3. Indium (In)
4. Aluminium (Al)

160. Determine the total energy used by a 100 W lamp for 12 hours and a 1.5 kW heater for 45 minutes.

- A. 2.325 kWh
- B. 8.37 MJ
- C. 2000 kCal
- D. All of the above

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Ans. D

Sol. Convert all the quantities to the same set of units, e.g. convert 1.5 kW to 1500 W and 45 minutes to 0.75 hour.

Then,

$$W = (100 \times 12) + (1500 \times 0.75) = 2325 \text{ Whr} = 2.325 \text{ kWh}$$

Now, 1 kWh = 3.6 MJ (mega-joule)

$$2.325 \times 3.6 = 8.37 \text{ MJ}$$

And 1 Joule = 0.239 calorie

$$8.37 \times 10^6 \times 0.239 = 2000 \text{ kCal}$$

161. Which of the following process is used for producing two different form of energy i.e., thermal energy or heat energy and electrical or mechanical energy, using a single source of fuel.

- A. Magneto Hydro dynamic power generation
- B. Bio gas
- C. Geo thermal
- D. Cogeneration

Ans. D

Sol. Cogeneration is also called as combined heat and power or combine heat and power. As its name indicates cogeneration works on concept of producing two different form of energy by using one single source of fuel. Out of these two forms, one must be heat or thermal energy and other one is either electrical or mechanical energy. Cogeneration is the most optimum, reliable, clean, and efficient way of utilizing fuel. The fuel may be natural gas, oil, diesel, propane, wood, biomass, coal, etc.

162. A 5 A ammeter has a resistance of 0.01  $\Omega$ . Determine the efficiency of the instrument.

- A. 20 A/W
- B. 10 A/W
- C. 0.2 A/W
- D. 0.1 A/W

Ans. A

Sol. The efficiency of any instrument is defined as the ratio of the measured quantity at full scale to the power taken by the instrument at full scale. The efficiency of an instrument should be as high as possible, as the higher the efficiency, the lesser will be the effect on instrument under measurements.

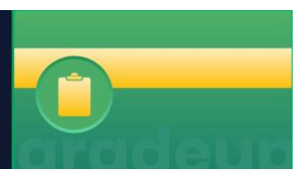
For voltmeter:

Efficiency of the instrument,

$$\eta = \frac{E_{fs}}{P_{fs}}$$

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For ammeter:

Efficiency of the instrument is

$$\eta = \frac{I_{fs}}{P_{fs}}$$

$$P_{fs} = I_{fs}^2 R_m = 5^2 \times 0.01 = 0.25 \text{ W}$$

$$\eta = \frac{5}{0.25} = 20 \text{ A/W}$$

163. Let self-inductances of two coils are  $L_1 = 2 \text{ H}$  and  $L_2 = 8 \text{ H}$ . The coil  $L_1$  produces a magnetic flux of  $80 \mu\text{Wb}$  of which only  $60 \mu\text{Wb}$  are linked with the coil  $L_2$ . Calculate the mutual inductance of the two coils.

- A. 2 H
- B. 1 H
- C. 3 H
- D. 4 H

Ans. C

Sol. The coefficient of coupling,  $K$  is given as

$$K = \frac{\text{mutual flux linkage between } L_1 \text{ and } L_2}{\text{flux produced by } L_1}$$

$$= \frac{60 \times 10^{-6}}{80 \times 10^{-6}} = 0.75$$

Mutual inductance,  $M$  is calculated as

$$M = K\sqrt{L_1 L_2}$$

$$= 0.75\sqrt{2 \times 8}$$

$$= 0.75 \times 4 = 3\text{H}$$

164. Dielectric heating works on the frequency range of about

- A. 1 – 100 KHz
- B. 10 – 30 MHz
- C. 30 – 100 GHz
- D. 10 – 10,000 Hz

Ans. B

Sol. Dielectric heating is carried out in high frequency voltage of about 20 kV at a frequency of 10 – 30 MHz.

165. A digital voltmeter has a read-out range from (0 – 9,999) counts. Determine the resolution of the instrument in Volt when the full-scale reading is 9.999 V.

- A. 0.1 mV
- B. 10 mV
- C. 1 mV
- D. 0.01 mV

Ans. C

Sol. If the input is slowly increased from some arbitrary (non-zero) input value, it will again be found that output does not change at all until a certain increment is exceeded. This increment is called resolution or discrimination of the instrument. Thus, the smallest

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increment in input (the quantity being measured) which can be detected with certainty by an instrument is its resolution. So, resolution defines the smallest measurable input change. Therefore, the resolution of this instrument is 1 or 1 count in 9,999.

$$\therefore \text{Resolution} = \frac{1}{9,999} \text{ count} = \frac{1}{9,999} \times 9.999 = 10^{-3} = 1 \text{ mV}$$

166. Which of the following is the method of neutral grounding?

- A. Peterson coil grounding
- B. Reactance grounding
- C. Solid grounding
- D. All of the above

Ans. D

Sol. The various methods of neutral grounding are as follows:

1. Solid or effective grounding
2. Resistance grounding
3. Reactance grounding
4. Peterson coil grounding
5. Voltage transformer earthing

167. Base to emitter voltage in forward biased transistor decreases with increase of temperature at the rate of

- A. 0.025 mV/°C
- B. 25 mV/°C
- C. 2.5 mV/°C
- D. 0.25 mV/°C

Ans. C

Sol. Base to emitter voltage in forward biased transistor decreases with increase of temperature at the rate of 2.5 mV/°C.

168. During welding, the voltage strike a DC arc is about \_\_\_\_\_ and that for AC arc is \_\_\_\_\_.

- A. 50 – 55 V, 80 – 90 V
- B. 15 – 20 V, 35 – 40 V
- C. 80 – 90 V, 50 – 55 V
- D. 35 – 40 V, 15 – 20 V

Ans. A

Sol. During welding, the voltage required for striking the arc is higher than needed for maintaining it, because it is difficult to maintain the arc with a voltage less than 14 V or more than 40 V. Hence, a voltage of 50 – 55 V is required to strike a DC arc whereas a voltage of 80 – 90 V is required to strike a AC arc.

169. Which of the following is correct to eliminate or reduce the process of cogging?

- A. The number of stator slots is made equal to the number of rotor slots.
- B. The ratio of stator slots to the rotor slots must be a non-integer value.
- C. The ratio of stator slots to the rotor slots must be an integer value.
- D. None of the above is correct.

Ans. B

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Sol. Cogging (or magnetic locking or teeth locking) is the process when the rotor teeth and the stator teeth (i.e. slots) face each other. Hence, the reluctance of the magnetic path is minimum, that is why rotor tends to remain fixed.

In order to reduce or eliminate the process of cogging, the number of stator slots are never made equal to the rotor or have an integral ratio. It can also be reduced by using the skewed rotor.

170. The insulation resistance in megaohms of an installation wire for domestic application shall not be
- A. Greater than 50 divided by the number of outlets.
  - B. Less than 50 divided by the number of outlets.
  - C. Greater than 25 divided by the number of outlets.
  - D. Less than 25 divided by the number of outlets.

Ans. B

Sol. The insulation resistance in megaohms of an installation wire shall not be less than 50 divided by the number of outlets. However, the whole installation need not be required to have an insulation resistance greater than 1 MΩ.

171. Universal motors has wide and easily controllable speed range, typically of
- A. 10,000 – 20,000 rev/min
  - B. 3,000 – 10,000 rev/min
  - C. 100 – 2,000 rev/min
  - D. 1,000 – 3,000 rev/min

Ans. B

Sol. Universal motors has a wide and easily controllable speed range, typically 10,000 – 3,000 rev/min, a rating up to about 500 W.

172. A 3-wire system requires only  $5/16^{\text{th}}$  (or 31.25%) as much copper as a 2-wire system. The above calculation is carried out using assumptions. Which of the following assumption is incorrect?
- A. The distance of the transmission line is same in both cases.
  - B. The efficiency of the transmission line is different in both cases.
  - C. Voltage at consumer's terminal is same in both cases.
  - D. The amount of power transmitted is same in both cases.

Ans. B

Sol. A 3-wire system requires only  $5/16^{\text{th}}$  (or 31.25%) as much copper as a 2-wire system. The assumptions are as follows:

1. The amount of power transmitted is the same in both the cases.
2. The distance of the transmission line is same in both the cases.
3. The efficiency of transmission line is same for both the cases.
4. The voltage at consumer's end is same for both the cases.
5. A 3-wire system is balanced and
6. In the 3-wire system, the mid wire is of half the cross-section of each outer.

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173. The time at which rate of rise of recovery voltage is maximum.

- A.  $\frac{\pi}{2}\sqrt{LC}$
- B.  $\pi\sqrt{LC}$
- C.  $\frac{\pi}{4}\sqrt{LC}$
- D.  $\frac{2\pi}{3}\sqrt{LC}$

Ans. A

Sol. The time at which rate of rise of recovery voltage is maximum is  $\frac{\pi}{2}\sqrt{LC}$ .

174. For a good power system, whether overhead or underground should fulfil the these below requirement. Which of the following is not correct?

- A. The voltage at the consumer's premises must be maintained within  $\pm 4$  or  $\pm 6\%$  of the voltage.
- B. The losses in the system should be a small percentage (about 10%) of the power transmitted.
- C. The maximum current passing through the conductor should be limited to such a value as not to overheat the conductor or damage.
- D. The insulation resistance of the whole system should be very less so that there is no undue leakage or danger to human life.

Ans. D

Sol. A good system whether overhead or underground should fulfil the following requirements:

- 1) The voltage at the consumer's premises must be maintained within  $\pm 4$  or  $\pm 6\%$  of the voltage.
- 2) The losses in the system should be a small percentage (about 10%) of the power transmitted.
- 3) The maximum current passing through the conductor should be limited to such a value as not to overheat the conductor or damage.
- 4) The insulation resistance of the whole system should be very high so that there is no undue leakage or danger to human life.

175. Which among the following is true?

- A. Peak factor is defined as the ratio of rms value to the peak value.
- B. Form factor is defined as the ratio of average value to the rms value.
- C. Form factor is defined as the ratio of rms value to peak value.
- D. Peak factor is defined as the ratio of peak value to rms value.

Ans. D

Sol. Peak factor or crest factor ( $K_p$ ): is defined as the ratio of peak value to the rms value.

Mathematically, it is defined as

$$\text{Peak factor} = \frac{\text{Peak value}}{\text{rms value}}$$

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Form factor ( $K_F$ ): is defined as the ratio of rms value to the average value.

Mathematically, it is given as

$$\text{Form factor} = \frac{\text{rms value}}{\text{Average value}}$$

For sinusoidal wave,

$$\text{Form factor } (K_f) = \frac{\text{rms value}}{\text{Average value}} = \frac{0.707I_m}{0.637I_m} = 1.11$$

$$\text{Peak factor } (K_p) = \frac{\text{Peak value}}{\text{rms value}} = \frac{I_m}{\frac{I_m}{\sqrt{2}}} = \sqrt{2} = 1.414$$

176. Which of the following below is the only difference in Ballistic galvanometer with respect to PMMC meter?

- A. It uses silk cover copper wire wound on the coil whereas PMMC uses phosphorus bronze wire for suspension.
- B. It uses phosphorus bronze wire wound on the coil whereas PMMC uses silk cover copper wire for suspension.
- C. It uses manganin wire wound on the coil whereas PMMC uses phosphorus bronze wire for suspension.
- D. It uses phosphorus bronze wire wound on the coil whereas PMMC uses manganin wire for suspension.

Ans. B

Sol. Ballistic galvanometer is a sophisticated instrument which works on the principle of PMMC meter with an only difference is the type of suspension used in this meter. Lamp and glass scale is used to obtain the deflection. A small mirror is attached to the moving system. Phosphorus bronze wire is used for suspension whereas in PMMC meter, silk cover copper wire is used for suspension.

177. Which of the following test is used to determine the inertia of the rotor?

- A. Load test
- B. Retardation test
- C. Regenerative test
- D. Back to back test

Ans. B

Sol. The moment of inertia is very important for the selection of a proper motor for drives involving many starts and stops or may require very good speed control characteristics. The inertia can be determined by the retardation test.

This test works on the principle that when a motor is switched off from the mains, it decelerates and come to rest. The angular retardation at any speed is proportional to the retarding torque and is inversely proportional to the inertia.

Mathematically, it is calculated as

$$J = \frac{T_{lost}}{\frac{d\omega}{dt}} \text{ kg-m}^2$$

Where,  $d\omega/dt$  is the slope of the retardation curve and the  $T_{lost}$  is the torque required to be met at the given speed.

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178. Which one of the following is not a reason, for a semiconductor silicon (Si) to be preferred over Germanium (Ge)?

- A. Higher temperature stability
- B. Higher band gap
- C. Higher leakage current
- D. Higher breakdown voltage

Ans. C

Sol. The elemental semiconductor Silicon (Si) is preferred over Germanium (Ge) for the following reasons:

1. Higher temperature stability
2. Higher band gap
3. Lower leakage current
4. Higher breakdown voltage
5. Easy fabrication process

179. Which of the following statement is true regarding the method of starting of synchronous motor?

- A. To reduce the speed of the rotating magnetic field of the stator to a low enough value that the rotor can easily accelerate and lock in with it.
- B. To use an external prime mover to accelerate the rotor of synchronous motor near to its synchronous speed.
- C. To use damper windings or Amortisseur windings.
- D. All of the above

Ans. D

Sol. Following are the methods of starting of synchronous motor:

- 1) To reduce the speed of the rotating magnetic field of the stator to a low enough value that the rotor can easily accelerate and lock in with it during one half-cycle of the rotating magnetic field's rotation. This is done by reducing the frequency of the applied electric power.
- 2) To use an external prime mover to accelerate the rotor of synchronous motor near to its synchronous speed then supply the rotor as well as stator, keeping in mind the direction of rotation of stator as well as rotor.
- 3) To use damper windings or Amortisseur windings in large synchronous motors in order to nullify the oscillations of the rotor whenever the synchronous machine is subjected to a periodically varying load.

180. The frequency of an A.C. synchronous generator is given as

- A.  $f = \frac{\omega_e}{2}$
- B.  $f = \frac{\omega_e}{2\pi}$
- C.  $f = \frac{\omega_e}{2P}$
- D.  $f = \frac{\omega_e}{2\pi P}$

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Ans. B

Sol. In an AC synchronous generator, there exists multiple poles (having two, four, six or eight poles), then for a speed of one revolution per second (1 rpm/60), the frequency per revolution will be one, two, three or four,..., cycles per revolution respectively. The frequency per revolution, is therefore, equal to the number of pairs of poles. Since, the frequency depends directly on the speed (rpm/60) and also on the number of pairs of poles (P/2), the equation is given as

$$f = \frac{P}{2} \times \frac{\text{rpm}}{60} = \frac{PN}{120} = \frac{P}{120} \times \frac{\omega_m \times 60}{2\pi} = \frac{P}{2} \times \frac{\omega_m}{2\pi} = \frac{\omega_e}{2\pi}$$

Where,

P is the number of poles

N is the speed in rpm (rev/min)

f is the frequency in hertz

$\omega_m$  is the speed in radians per second (rad/sec)

$\omega_e$  is the speed electrical radians per second.

181. Calculate the charge Q required to move from one point to another point, if the potential difference between these two points is 140 mV and 280  $\mu\text{J}$  of work is required to move that charge?

- A. 2  $\mu\text{C}$
- B. 1 mC
- C. 2 mC
- D. 1  $\mu\text{C}$

Ans. C

Sol. Potential difference between two points is 140 mV.

Work done to move charge Q from one point to another point is 280  $\mu\text{J}$

Therefore,

$$Q = \frac{W}{V}$$
$$= \frac{280 \times 10^{-6}}{140 \times 10^{-3}} = 2 \times 10^{-3}$$
$$= 2\text{mC}$$

182. The time between the instant of closing of relay contacts to the instant of final arc extinction inside the medium and removal of the fault is defined as \_\_\_\_\_.

- A. Relay time
- B. Circuit breaker time
- C. Dead time
- D. Rise time

Ans. B

Sol. The time between the instant of closing of relay contacts to the instant of final arc extinction inside the medium and removal of the fault is defined as breaker time.

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183. Consider a transformer of certain rating, is designed such that flux density and current density remains the same. And now, the linear dimensions are made larger by a factor of K, then which of the following below is correct?
- A. Conductor area increases by a factor of  $K^2$
  - B. Losses in the transformer increase by a factor of  $K^3$
  - C. Rating of the transformer increases by a factor of  $K^4$
  - D. All of the above

Ans. D

Sol. In a transformer of certain rating, is designed such that flux density and current density remains the same. If now, the linear dimensions are made to change by a factor of K, then the conductor area increases by a factor of  $K^2$ . The losses in the machine, which are proportional to the volume of the material used, increase by a factor of  $K^3$ . The rating of the machine increases by a factor of  $K^4$ . The ratio of losses per surface area increases by a factor of K.

184. Consider a three phase, 415 V, 50 Hz, 10 HP induction motor. Assume efficiency be 75% and power factor be 0.8. find the rating of the fuse for safe operating of the machine?
- A. 20 A
  - B. 25 A
  - C. 30 A
  - D. 15 A

Ans. C

Sol. Full load current of the motor,

$$I_L = \frac{\text{rated HP} \times 735.5}{\sqrt{3} \times V_L \times \text{power factor} \times \text{efficiency}}$$
$$= \frac{10 \times 735.5}{\sqrt{3} \times 415 \times 0.8 \times 0.75}$$
$$= 17 \text{ A}$$

Starting current = 1.5 x load current

$$= 1.5 \times 17 = 26.6 \text{ A}$$

So, from the options only 30 A fuse can be selected.

185. When a current is applied between the two ends of the metal piece when they are quite close to each other but not touching, under which welding, this phenomenon occurs?
- A. Butt welding
  - B. Flash welding
  - C. Stud welding
  - D. Plasma welding

Ans. B

Sol. Butt welding: when two workpieces are brought into contact end to end and butted ends are heated by passing a heavy current through the joint, this form of welding is known as Butt welding.

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Flash welding: It is similar to the butt welding but with the difference that here current is applied when ends of the two metal pieces are quite close to each other but do not touch.

Stud welding: It is similar to the flash welding but with the difference that here a stud (or rod) and a surface of the base metal is welded.

Plasma welding: This produces high current electronic arc using plasma gas like argon and helium.

186. In Electrolysis process, when the chemical deposition due to flow of electric current through an electrolyte is directly proportional to the quantity of electricity passed through it, is based on which of the following Law?

- A. Faraday's Law of Electromagnetic Induction
- B. Faraday's First Law of Electrolysis
- C. Faraday's Second Law of Electrolysis
- D. None of the above

Ans. B

Sol. According to Faraday's First Law of Electrolysis, the chemical deposition due to the flow of electric current through an electrolyte is directly proportional to the quantity of electricity (coulombs) passed through it.

i.e. mass of chemical deposition,

Mathematically, it is expressed as

$$m = Z.Q$$

187. During the Thermal ionization of gas in circuit breaker, the molecules collides each other at a rate of

- A.  $10^9$  times/second
- B.  $10^{10}$  times/second
- C.  $10^{11}$  times/second
- D.  $10^{12}$  times/second

Ans. B

Sol. There are number of free electrons and ions present in the medium separating the two contacts of the circuit breaker. These free electrons and ions are so few in number that they are insufficient to sustain conduction of electricity. The gas molecules move randomly at room temperature. It is found an air molecule at a temperature of  $300^\circ\text{K}$  moves randomly with an approximate average velocity of 500 m/sec and collides each other molecules at a rate of  $10^{10}$  times/second. These randomly moving molecules collide each other in very frequent manner.

188. A PMMC instrument having meter resistance of  $150 \Omega$  is required to use as an extension of current range by connecting shunt resistance of  $30 \Omega$ . Find the value of multiplication factor for the instrument.

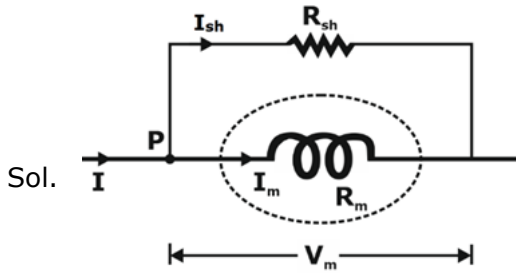
- A. 3
- B. 5
- C. 6
- D. 4

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Ans. C



$R_m$  = resistance of meter

$R_{sh}$  = resistance of the shunt

$I_m$  = current through meter

$I_{sh}$  = current through shunt

Since, both the branches are connected in parallel, therefore,  $V_{sh} = V_m$

$$I_m R_m = I_{sh} R_{sh}$$

$$\frac{I_m}{I_{sh}} = \frac{R_{sh}}{R_m}$$

Applying KCL at point 'P',

$$I = I_{sh} + I_m$$

Dividing the above equation by  $I_m$ ,

$$\frac{I}{I_m} = 1 + \frac{I_{sh}}{I_m}$$

$$m = 1 + \frac{R_m}{R_{sh}}$$

$$m = 1 + \frac{150}{30} = 6$$

189. According to the Specification for Electric ceiling fans and regulators, no ceiling fan should be installed at a height of less than \_\_\_\_\_ from the floor level.

- A. 3.75 m
- B. 2.75 m
- C. 1.75 m
- D. 4.75 m

Ans. B

Sol. No ceiling fan should be installed at a height of less than 2.75 m from the floor level. The suspension hooks for ceiling fans should be fixed in roofs during construction stage. The fan rod should preferably be of one piece. All ceiling fans should be wired to ceiling roses or to special connector boxes. Ceiling fans including their suspension should conform to IS: 364-1960/1966 – Specification for Electric Ceiling Fans and Regulators.

190. Which among the following motor has rotor with low voltage commutator winding?

- A. Commutator motor
- B. Stepper motor
- C. Universal motor
- D. Schrage motor

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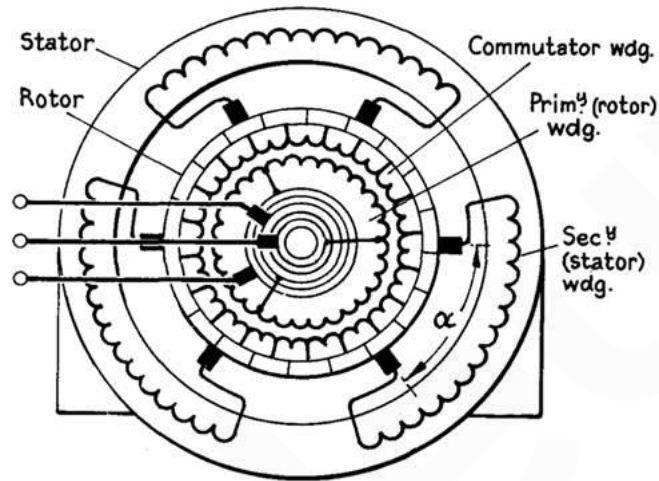




Ans. D

Sol. Schrage Motor:

The primary 3-phase winding is carried by the rotor and is connected to the supply through slip rings and brushes. The rotor also has a low voltage commutator winding in the same slots as the primary with conductors set nearer to the slot openings. The stator has a 3-phase distributed winding, each phase being terminated on a pair of commutator brushes. The connection of winding in Schrage motor is given as:



191. For a certain dynamometer ammeter, the mutual inductance 'M' varies with the deflection  $\theta$  as  $M = -6\cos(\theta + 30^\circ)$  mH. Find the deflecting torque (in  $\mu\text{Nm}$ ) produced by a direct current of 50 mA corresponding to a deflection of  $60^\circ$ .

- A. 30
- B. 15
- C. 25
- D. 20

Ans. B

Sol. For a dynamometer type instrument,

$$T_d = I_1 I_2 \frac{dM}{d\theta}$$

$$M = -6 \cos(\theta + 30^\circ) \text{ mH}$$

$$\frac{dM}{d\theta} = 6 \sin(\theta + 30^\circ) \text{ mH}$$

$$\left. \frac{dM}{d\theta} \right|_{\theta=60^\circ} = 6 \sin 90^\circ = 6 \text{ mH/deg}$$

$$T_d = I^2 \frac{dM}{d\theta} = (50 \times 10^{-3})^2 \times 6 \times 10^{-3} = 15 \times 10^{-6}$$

$$T_d = 15 \mu\text{Nm}$$

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192. Due to hysteresis affect, the reading of the moving iron type instruments is not measured correctly. We can we eliminate this
- A. By using small iron parts with wide hysteresis loop so that demagnetization takes place very quickly.
  - B. By using large iron parts with narrow hysteresis loop so that demagnetization takes place very quickly.
  - C. By using small iron parts with narrow hysteresis loop so that demagnetization takes place very quickly.
  - D. Cannot be eliminated.

Ans. C

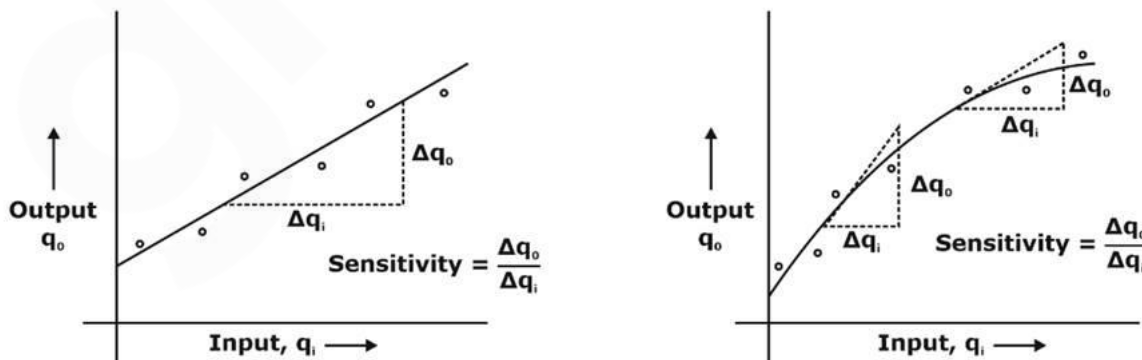
Sol. Due to hysteresis affect, the reading of the instrument will not be correct. When the current is decreasing, the flux produced will not decrease suddenly. Due to this meter reads a higher value of current. Similarly, when the current increases the meter reads a lower value of current. This produces error in deflection. This error can be eliminated using small iron parts with narrow hysteresis loop so that the demagnetization takes place very quickly.

193. Static sensitivity of an instrument is defined as
- A. the ratio of magnitude of the output signal or response to the magnitude of the input signal.
  - B. the ratio of the magnitude of the measured quantity to the magnitude of the response.
  - C. the ratio of infinitesimal change in output to the infinitesimal change in input signal.
  - D. All of the above

Ans. D

Sol. The static sensitivity of an instrument or an instrumentation system is the ratio of the magnitude of the output signal or response to the magnitude of input signal or the quantity being measured. Its units are millimetre per micro-ampere, counts per volt, etc. depending upon the type of the input and output.

Sometimes, the static sensitivity is expressed as the ratio of the magnitude of the measured quantity to the magnitude of the response.



In general, the static sensitivity at the operating point is defined as the ratio of the infinitesimal change in output to the infinitesimal change in input.

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194. Find the induced EMF in a conductor rotating in a magnetic field, having 4 poles, flux per pole be 0.3 mWb and rotates with 300 revolutions per second.

- A. 1.4 V
- B. 0.36 V
- C. 2 V
- D. 0.5 V

Ans. B

Sol. Induced emf  $e = (P \times \phi \times n)$  Volts

where, P is the number of poles

$\phi$  is the flux per pole

n is the revolution per second

$$e = 4 \times 0.3 \times 10^{-3} \times 300 = 0.36 \text{ V}$$

195. Which of the following statement is not true?

- A. Strength of the magnetic does not on the distance
- B. Flux lines near to the magnet are more closely spaced
- C. Flux is uniformly distributed over an area
- D. Lines of magnetic flux forms closed loop which enters to south pole and leaves from north pole

Ans. A

Sol. 1. The strength of the magnetic field depends on the distance, i.e., the magnitude of magnetic field decreases with distance.

2. Flux lines near to the magnet are more closely packed and those having same direction of current, repel each other and those having opposite direction, attract each other.

3. Flux is uniformly distributed over an area of the magnet, i.e., at any point with respect to any pole, the magnetic strength remains the same.

4. Lines of magnetic flux forms closed loop which enters to south pole and leaves from north pole and inside the magnet, the magnetic lines forces travels from south to north.

196. Which of the following statement is not true regarding a force acting on a current carrying conductor placed in a magnetic field

- A. It depends on magnitude of the flux density
- B. It depends on the area of the magnetic poles
- C. It depends on the effective length of the conductor
- D. None of the above

Ans. D

Sol. When a conductor carrying current is placed in a magnetic field, it experiences a force called magnetic force. This force on the conductor depends on the flux or flux density, area of the magnetic poles, effective length of the conductor in the magnetic field, current I flow the circuit and angle between differential length  $dl$  and current I.

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197. Which of the following is true regarding power factor?

- A.  $\text{p.f.} = \cos \phi = \frac{\text{Actual power}}{\text{Apparent power}}$       B.  $\text{p.f.} = \cos \phi = \frac{\text{Apparent power}}{\text{Reactive power}}$   
C.  $\text{p.f.} = \cos \phi = \frac{\text{Quadrature power}}{\text{Complex power}}$       D.  $\text{p.f.} = \cos \phi = \frac{\text{Real power}}{\text{Quadrature power}}$

Ans. A

Sol. Power factor is defined as the ratio of real or actual power to the complex or apparent power, i.e.,

$$\begin{aligned}\cos \phi &= \frac{\text{Actual power}}{\text{Apparent power}} \\ &= \frac{\text{Real power}}{\text{Apparent power}} \\ &= \frac{\text{Actual power}}{\text{Complex power}} \\ &= \frac{\text{Real power}}{\text{Complex power}}\end{aligned}$$

198. When the shaft load is assumed to be constant, the effect of changes in field excitation on performance of synchronous motor is given by

- A.  $V \cos \phi = \text{constant}$       B.  $V \sin \phi = \text{constant}$   
C.  $E_f \cos \delta = \text{constant}$       D.  $E_f \sin \delta = \text{constant}$

Ans. D

Sol. The effect of changes in field excitation on armature current, power angle and power factor of a synchronous motor operating with a constant shaft load, from a constant voltage constant, constant frequency supply is given as

$$E_f \sin \delta = \text{constant}$$

199. The h-parameter equivalent circuit of a transistor is valid for

- A. High frequency, large signal operation  
B. High frequency, small signal operation  
C. Low frequency, large signal operation  
D. Low frequency, small signal operation

Ans. D

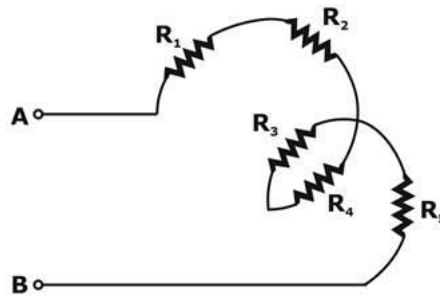
Sol. The h-parameter equivalent circuit of a junction transistor is valid for low frequency and small signal analysis.

200. Determine the equivalent resistance across the AB terminals. Assume each resistor band code as yellow, green and red.

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A. 13.5 kΩ

B. 22.5 kΩ

C. 16.8 kΩ

D. 28 kΩ

Ans. A

Sol. According to the colour coding of resistors,

Colour	Digit	Multiplier	Tolerance
Black	0	1	
Brown	1	10	± 1%
Red	2	100	± 2%
Orange	3	1,000	
Yellow	4	10,000	
Green	5	100,000	± 0.5%
Blue	6	1,000,000	± 0.25%
Violet	7	10,000,000	± 0.1%
Grey	8		± 0.05%
White	9		
Gold		0.1	± 5%
Silver		0.01	± 10%
None			± 20%

$$R_1 = R_2 = R_3 = R_4 = R_5 = 45 \times 10^2 = 4.5 \times 10^3 = 4.5 \text{ k}\Omega$$

Whenever the two or more resistance are connected across the same node, then they will not contribute in the equivalent resistance because the current will not flow through those resistors.

$$R_{AB} = R_1 + R_2 + R_5 = 4.5 + 4.5 + 4.5 = 13.5 \text{ k}\Omega$$

\*\*\*\*

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