



SSC JE 2019-20

Electrical Engineering

Mega Mock
Challenge

(04 Mar - 05 Mar 2020)

Questions &
Solutions

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

1161, 1164, 1168, 1173, 1179, ?

- A. 1186
- B. 1196
- C. 1185
- D. 1197

Ans. A

Sol. $1161 + 3 = 1164$

$1164 + 4 = 1168$

$1168 + 5 = 1173$

$1173 + 6 = 1179$

$1179 + 7 = 1186$

Hence, option A is the correct answer.

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

Punjab : Bhangra : : Gujarat : ?

- A. Bihu
- B. Garba
- C. Ghumar
- D. Kathak

Ans. B

Sol. Bhangra is the traditional dance of Punjab. Similarly, Garba is the traditional dance of Gujarat. Thus Gujarat is related to Garba.

Hence, option B is the correct answer.

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

- 1) Philosopher
- 2) Pharmacy
- 3) Piercing
- 4) Salesman
- 5) Saleswoman

- A. 21345
- B. 53214
- C. 34215
- D. 24513

Ans. A

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

- 2) Pharmacy
- 1) Philosopher
- 3) Piercing
- 4) Salesman
- 5) Saleswoman

Hence, option A is the correct answer.

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

42 : 14 :: 56 : ?

- A. 18
- B. 41
- C. 48
- D. 65

Ans. B

Sol. As in the 1st pair:

$4 \times 2 + (4 + 2) \Rightarrow 8 + 6 = 14$

Therefore, 2nd pair will be like:

$5 \times 6 + (5 + 6) \Rightarrow 30 + 11 = 41$

Hence, option B is the correct response.

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

- A. JQ
- B. HS
- C. BX
- D. GT

Ans. C

Sol.

Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Position value	1	2	3	4	5	6	7	8	9	10	11	12	13
Alphabet	Z	Y	X	W	V	U	T	S	R	Q	P	O	N
Position value	26	25	24	23	22	21	20	19	18	17	16	15	14

$J + Q = 27$

$H + S = 27$

$B + X = 26$

$G + T = 27$

Hence, option C is the correct answer.

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

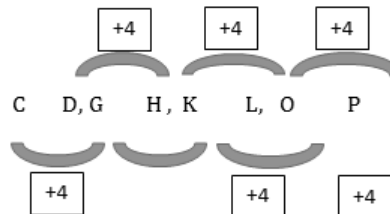
CD, GH, KL, ?

- A. PN
- B. NO
- C. NP
- D. OP

Ans. D

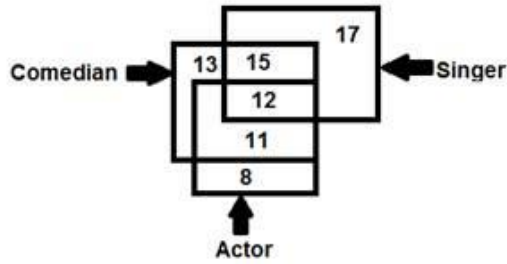
Sol. There are 26 alphabets in English and if we give assign to each and every alphabet starting from 'A', 'B', 'C', etc. , it will appear to be:

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



Hence, option D is the correct answer.

7. The following Venn Diagram shows information about the total number of the person who has a different profession.

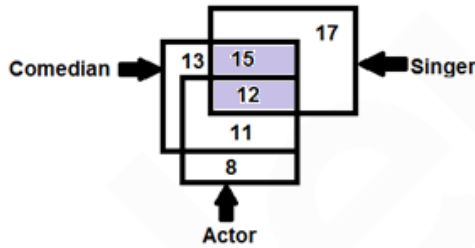


What is the ratio of Singer and Comedian but not Actor to all actor, singer and comedian?

- A. 4/5
- B. 13/8
- C. 15/11
- D. 5/4

Ans. D

Sol.



The ratio of the Singer and Comedian but not Actor to all actor, singer and comedian = $15/12$

On solving we get = $5/4$

Hence, option D is the correct answer.

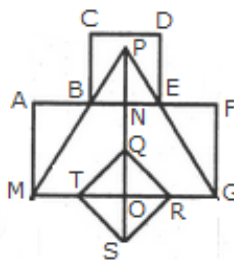
8. How many triangles are in the given figure?



- A. 14
- B. 25
- C. 16
- D. 23

Ans. C

Sol.



16 triangles in all; BPN, PNE, ABM, EFG, QRO, RSO, STO , QTO , BPE, TQR, QRS, RST , STQ, MPO, GPO and MPG.

Hence, option C is the correct answer.

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

DOG : KENNEL :: BEE : ?

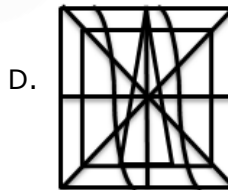
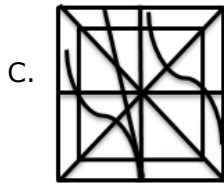
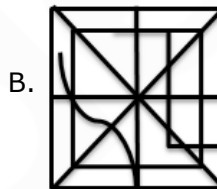
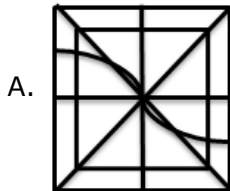
- A. HIVE
- B. NEST
- C. HOLE
- D. BARN

Ans. A

Sol. Dog lives in a kennel. Similarly, bee lives in a hive.

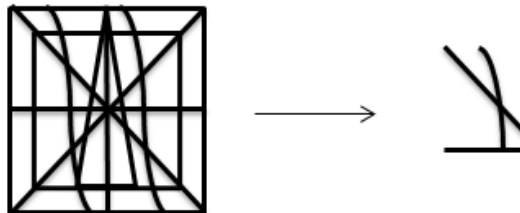
Hence, option A is the correct answer.

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



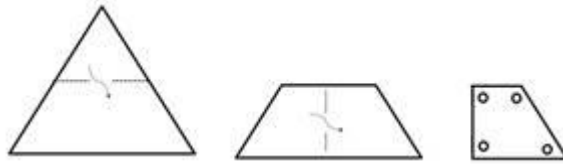
Ans. D

Sol. After carefully observing the figures given in the question, it is very clear that the question figure is embedded in the answer figure (D). It is shown as given below:



Hence, Option D is the correct answer.

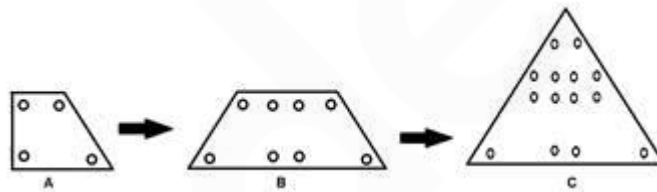
11. A piece of paper is folded and punched as shown below. From the given responses indicate how it will appear when opened.



- A.
- B.
- C.
- D.

Ans. C

Sol. After Unfolded the paper we get:



Hence, option C is the correct answer.

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

AC, EG, ?, MO

- A. IK
- B. IJ
- C. IL
- D. IM

Ans. A

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

And, the series is written with only odd position alphabets i.e.

AC, EG, IK, MO

Hence, option A is the correct answer.

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

SELECTIVENESS

A. SUSTAIN

B. VEST

C. CANCEL

D. SELLES

Ans. B

Sol. Clearly, the word 'VEST' can be formed by using the letters of given word.

Hence, option B is the correct answer.

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

150	225	75
400	120	?
80	140	44

A. 104

B. 130

C. 120

D. 224

Ans. A

Sol. Logic-

Row 1:

$$(150+225)/5=75$$

Row 2:

$$(400+120)/5=104$$

Row 3:

$$(80+140)/5=44$$

Hence, option A is the correct answer.

15. A statement is given followed by two course of action. Candidate is required to grasp the statement and analyses the problem or policy it mentions and then decide which course of action logically follows.

Statement:

Google parent company Alphabet has moved its Jigsaw technology incubator under Google management.

Course of action:

I. Jigsaw was focused on online security issues like harassment and misinformation.

II. Google management should have the best policy to control Jigsaw technology incubator.

A. Only I follows

B. Only II follows

C. Both I and II follow

D. Either I or II follows

Ans. B

Sol. Course of action: I. Jigsaw was focused on online security issues like harassment and misinformation. (It does not follow as its just a statement, not action.)

II. Google management should have the best policy to control Jigsaw technology incubator. (It follows.)

So, Only II follows.

Hence, option B is the correct answer.

16. In the following question, select the odd number from the given alternatives.

A. 2437

B. 9118

C. 8548

D. 7649

Ans. A

Sol. If we consider the last two digits as one number, then that number is given by:

$9118 \rightarrow 18 = 9 \times (1 + 1) \rightarrow$ i.e. first number multiplied by succession of 2^{nd} number.

$8548 \rightarrow 48 = 8 \times (5 + 1)$

$7649 \rightarrow 49 = 7 \times (6 + 1)$

But it's not applicable with 2437.

Hence, option A is the correct answer.

17. $12 * 18 * 3 * 4 = 2 * 5 * 4$

Which set of symbols can replace *?

A. +, x, /, x, +

B. +, /, -, x, -

C. +, /, -, x, +

D. +, x, -, /, x

Ans. C

Sol. option A $12+18 \times 3/4 = 25.5$ and RHS $2 \times 5+4 = 14$ so LHS not equal to RHS.

option B $12+18/3-4 = 14$ and RHS $2 \times 5-4 = 6$, LHS not equal to RHS.

option C $12+18/3-4$ gives 14 and RHS $2 \times 5+4$ gives 14 so RHS=LHS

Hence, option C is the correct answer.

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

A. Oscar Award

B. Arjuna Award

C. Dhyan Chand Award

D. Dronacharya Award

Ans. A

Sol. In this question, we show that -

Option A (Oscar Award) is the award in the field of the film industry and rest Option B (Arjuna Award), option C (Dhyan Chand Award), and Option D (Dronacharya Award) are the awards in the field of sports.

So, Oscar Award is different from others.

Hence, option A is the correct answer.

19. If $9 \times 0 \times 4 \times 1 = 5$ and $1 \times 7 \times 3 \times 2 = 12$ then what will be the value of $0 \times 2 \times 3 \times 4 = ?$
- A. 11
B. 10
C. 7
D. None of these.

Ans. C

Sol. Here, the logic used in the given equations is as follows:

(First Number \times Second Number) + Third Number + Fourth Number = Result.

Equation I: $9 \times 0 \times 4 \times 1 = 5 \Rightarrow (9 \times 0) + 4 + 1 = 5$

Equation II: $1 \times 7 \times 3 \times 2 = 12 \Rightarrow (1 \times 7) + 3 + 2 = 12$

Similarly for equation III we get,

$\Rightarrow (0 \times 2) + 3 + 4 = 7$

Hence, option C is the correct answer.

20. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.
- 6, 13, 33.5, 101.5, 356.25, ?
- A. 1526
B. 1426
C. 1326
D. 1725

Ans. B

Sol. Given series follows the pattern given below:

$6 \times 2 + 1 = 13$

$13 \times 2.5 + 1 = 33.5$

$33.5 \times 3 + 1 = 101.5$

$101.5 \times 3.5 + 1 = 356.25$

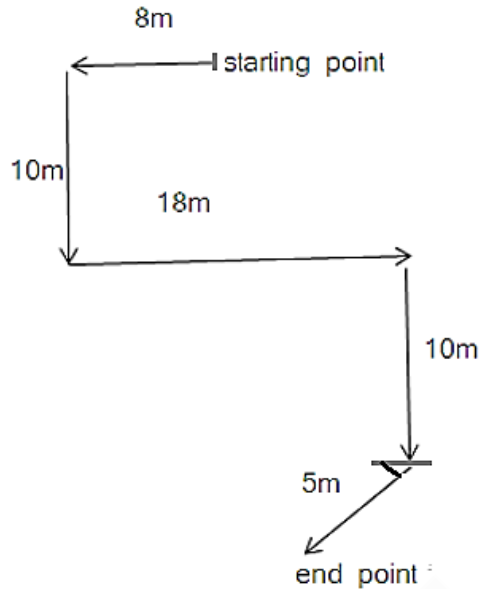
$356.25 \times 4 + 1 = 1426$

Hence, option B is the correct answer.

21. Ramesh goes 8m in the west direction and turns to his left and goes 10m, again he took a left turn and moves 18m. Now he turned right and moved 10m and finally he turns 45 degree clockwise and goes 5m. Now he is in which direction from his starting point?
- A. north-east
B. south-east
C. north-west
D. south-west

Ans. B

Sol.



So, he is in south-east direction from his starting point.

Hence, option B is the correct answer.

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

- | | |
|------------|-------------|
| 1) Jumbo | 2) Juggling |
| 3) Justice | 4) Jewel |
| 5) Jealous | |
| A. 54213 | B. 23415 |
| C. 12345 | D. 42315 |

Ans. A

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

- 5) Jealous
- 4) Jewel
- 2) Juggling
- 1) Jumbo Jet
- 3) Justice

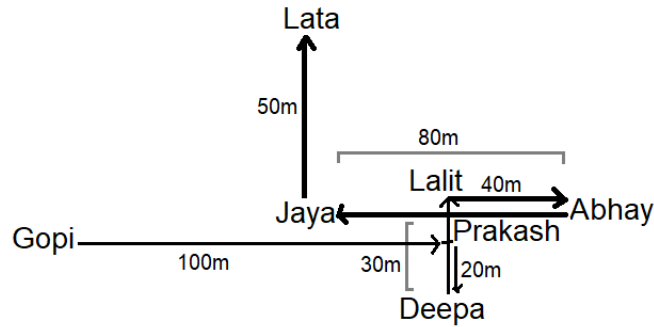
Hence, option A is the correct answer.

23. Lata is in the north of Jaya at a distance of 50m who is in the west of Abhay at a distance of 80m. Abhay is in the east of Lalit at a distance of 40m who is in the north of Deepa at a distance of 30m. Deepa is in the south of Prakash at a distance of 20m who is in the east of Gopi at a distance of 100m. Abhay is in which direction with respect to Lata?

- | | |
|---------------|---------------|
| A. south-east | B. north-east |
| C. east | D. west |

Ans. A

Sol. According to question:-



So, Abhay is in south-east direction with respect to Lata.

Hence, option A is the correct answer.

24. A is five ranks ahead of B who ranks 20th in a class of forty students. What is A's rank from the last?

- A. 23
- B. 22
- C. 26
- D. 27

Ans. C

Sol. B = 20th from top

A is five rank ahead = 20-5 = 15th from top

So A rank from bottom = total number of students - A rank from top + 1

= 40 - 15 + 1

= 25 + 1

= 26

A's rank from last/bottom is 26.

Hence, option C is the correct answer.

25. Two statements are given followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements :

Some drive are cassettes.

All cassettes are memory.

Conclusions :

I. All memory are cassettes.

II. All drive are cassettes.

III. Some memory are drive.

A. Only conclusion III follows

B. Only conclusion I and II follow

C. None of the conclusions follows.

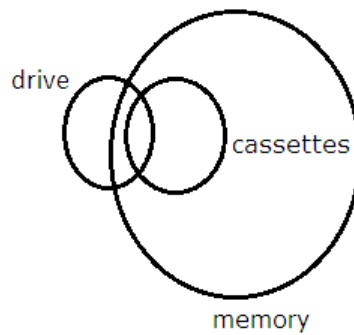
D. Either conclusion II or III follows.

Ans. A

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Sol. Minimum Possible diagram is-



Conclusions :

I. All memory are cassettes. (It does not follow as its just a possibility, not surety.)

II. All drive are cassettes.(It also does not follow independently as its just a possibility, not surety.)

III. Some memory are drive. (It follows as its obvious from the above diagram.)

So, Only conclusion III follows.

Hence, option A is the correct answer.

26. Two statements are given followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements :

No Lines are Tables.

All Tables are Radar.

Conclusions :

I. Some lines are radar.

II. All radar are tables.

III. No lines are radar.

A. Either conclusion I or III follows.

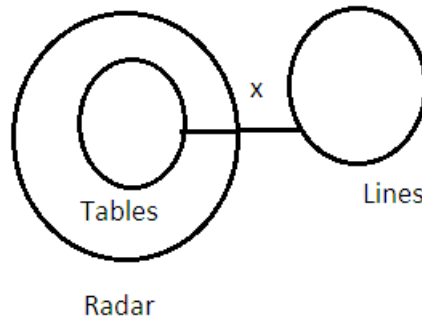
B. Only conclusion I and II follow

C. Only conclusion I and III follow

D. All the conclusions I, II and III follow

Ans. A

Sol. Minimum Possible diagram is-



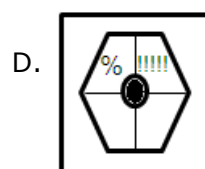
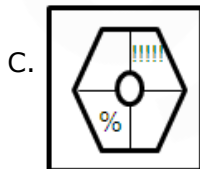
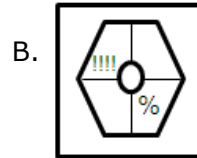
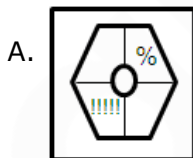
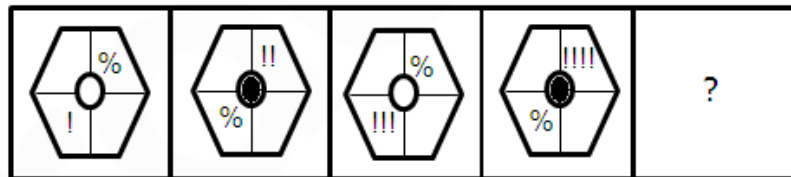
Conclusions :

- I. Some lines are radar. (It does not follow independently as it is just a possibility, not surety.)
- II. All radar are tables. (It also does not follow independently as it is just a possibility, not surety.)
- III. No lines are radar. (It also does not follow independently as it is just a possibility, not surety.)

Here, Either conclusion I or III follows because some + no makes either or situation.

Hence, option A is the correct answer.

27. Select the figure that will come next in the following figure series.



Ans. A

Sol. After carefully observing the figures given in the question, it is very clear that the answer figure(a) will be the next figure.

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Logic- Circle gets whitened and darken alternately. % and ! interchange its places in each step. ! is increasing by +1 in each step.



Hence, option A is the correct answer.

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

- A. Hudhud
- B. Trami
- C. Beetle
- D. Vardah

Ans. C

Sol. Except for Beetle, all are the name of Cyclone. The beetle is an insect.

Hence, option C is different from others.

29. Which of the following diagrams indicates the best relation between Fox, carnivorous and toads?



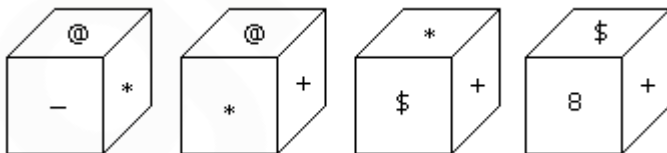
Ans. C

Sol. Toad and Fox are carnivorous animals.



Hence, option C is the correct answer.

30. Which symbol will be on the face opposite to the face with symbol *?



- A. @
- B. \$
- C. 8
- D. +

Ans. C

Sol. The symbol of the adjacent faces to face with symbol * are @, -, + and \$. Hence the required symbol is 8.

Hence, option C is the correct answer.

31. In the following question, select the related group of letters from the given alternatives.

E H J : K N P :: SVX : ?

- A. XZZ
- B. YBD
- C. BDF
- D. ZBD

Ans. B

Sol.

E	H	J
+6	+6	+6
↓	↓	↓
K	N	P

Similarly,

S	V	X
+6	+6	+6
↓	↓	↓
Y	B	D

Thus, SVX is related to YBD.

Hence, option B is the correct answer.

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

- A. CEF
- B. GIJ
- C. LNO
- D. STW

Ans. D

Sol.

Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Position value	1	2	3	4	5	6	7	8	9	10	11	12	13
Alphabet	Z	Y	X	W	V	U	T	S	R	Q	P	O	N
Position value	26	25	24	23	22	21	20	19	18	17	16	15	14

$C + 2 = E, E + 1 = F$

$G + 2 = I, I + 1 = J$

$L + 2 = N, N + 1 = O$

$S + 1 = T, T + 3 = W$

Hence, option D is the correct answer.

33. Select the number-pair in which the two numbers are related in the same way as are the two numbers of the following number-pair.

50 : 99

- A. 63 : 77
- B. 41 : 66
- C. 65 : 88
- D. 59 : 99

Ans. C

Sol. As,

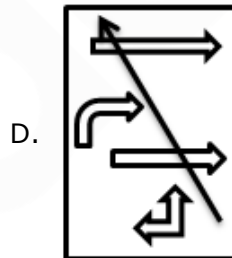
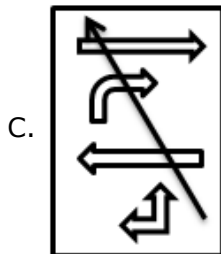
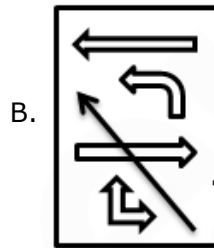
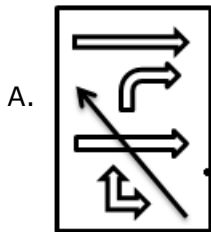
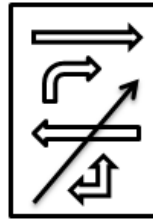
$$50 : 99 = 10 \times 5, 9 \times 11$$

Similarly,

$$65 : 88 = 13 \times 5, 8 \times 11$$

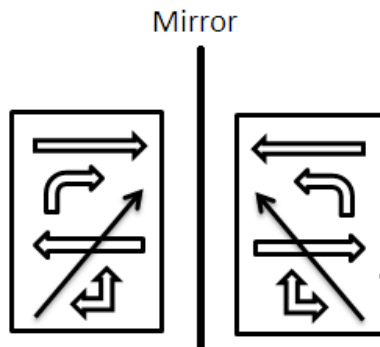
Hence, option C is the correct response.

34. Select the correct mirror image of the given figure when the mirror is placed to the right of the figure.



Ans. B

Sol. In a plane mirror, a mirror image is a reflected duplication of an object that appears almost identical, but it is reversed in the direction perpendicular to the mirror surface. As an optical effect, it results from the reflection of substances such as a mirror or water.



Hence, option B is the correct answer.

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

- A. DAH
- B. IFM
- C. ROV
- D. FHA

Ans. D

Sol.

Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Position value	1	2	3	4	5	6	7	8	9	10	11	12	13
Alphabet	Z	Y	X	W	V	U	T	S	R	Q	P	O	N
Position value	26	25	24	23	22	21	20	19	18	17	16	15	14

$D - 3 = A, D + 4 = H$

$I - 3 = F, I + 4 = M$

$R - 3 = O, R + 4 = V$

$F + 2 = H, F - 5 = A$

Hence, option D is the correct answer.

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

- A. 14 - 48
- B. 12 - 72
- C. 11 - 88
- D. 8 - 24

Ans. A

Sol. Here 48 is not a multiple of 14. In rest, all pairs 2nd number is multiple of the first number.

$12 \times 6 = 72$

$11 \times 8 = 88$

$8 \times 3 = 24$

Thus 14 - 48 is the odd number pair.

Hence, option A is the correct answer.

37. In the following question, select the odd number pair from the given alternatives.

- A. 11 - 15
- B. 13 - 17
- C. 12 - 16
- D. 14 - 16

Ans. D

Sol. From the given options,

$11 + 4 = 15$

$13 + 4 = 17$

$12 + 4 = 16$

$14 + 4 \neq 16$

Clearly, option D is not following the rule like others.

Hence, the correct option is D.

38. In a certain code language, BOOKS is written as ROOKA and DRONS is written as RRONC. How would MANAGE be written in that code language?

- A. MMAZGE
- B. GEMMAZ
- C. MMGEAZ
- D. AZMMGE

Ans. C

Sol. All the letters are written alphabetically from right to the left and then the first and the last letters are moved one place backward in the English alphabet.

So, MANAGE = MMGEAZ

Hence, option C is the correct answer.

39. In the following question, select the related group of letters from the given alternatives. LKJ : MNO :: EDC : ?

- A. FGI
- B. FHG
- C. FGH
- D. FGJ

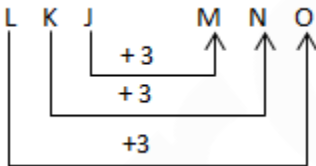
Ans. C

Sol. Let us first write down the alphabets and their corresponding positions in the English alphabetic series.

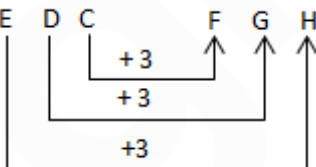
A	B	C	D	E	F	G	H	I	J
1	2	3	4	5	6	7	8	9	10
K	L	M	N	O	P	Q	R	S	T
11	12	13	14	15	16	17	18	19	20

U	V	W	X	Y	Z
21	22	23	24	25	26

Here, LKJ : MNO may be written as follows:



Similarly,



Hence, option C is the correct answer.

40. Four words are given below out of which three are alike in some manner and one is different. Which is different from the rest?

- A. Fox
- B. Wolf
- C. Jackal
- D. Deer

Ans. D

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Sol. Except deer, all other animal eats meat, while deer eat grass.
Hence, option D is different from the rest.

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

Question figure:



Answer figure:



A



B



C



D

A. Figure A

B. Figure B

C. Figure C

D. Figure D

Ans. C

Sol. After observing the given diagram carefully, option figure C will complete the given question figure.



Hence, option C is the correct answer.

42. In a certain code language, "CLAT-UG" is written as "8". How is "NEET-PG" written in that code language?

A. 21

B. 27

C. 19

D. 17

Ans. A

Sol.

Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Position value	1	2	3	4	5	6	7	8	9	10	11	12	13
Alphabet	Z	Y	X	W	V	U	T	S	R	Q	P	O	N
Position value	26	25	24	23	22	21	20	19	18	17	16	15	14

Considering the place value of letters we get,

$$CLAT-UG \Rightarrow (3 + 12 + 1 + 20 = 36) - (21 + 7 = 28) \rightarrow 36 - 28 = 8$$

Similarly,

$$\text{NEET-PG} \Rightarrow (14 + 5 + 5 + 20 = 44) - (16 + 7 = 23) \rightarrow 44 - 23 = 21$$

Thus code for NEET-PG = 21

Hence, option B is the correct answer.

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

$$12 : 18 :: 80 : ?$$

- A. 125
- B. 100
- C. 120
- D. 122

Ans. C

Sol. $6 \times 2 = 12$ and $6 \times 3 = 18$

Similarly,

$$40 \times 2 = 80 \text{ and } 40 \times 3 = 120$$

Hence, option C is the correct answer.

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

ART, DTU, ?, JXW, MZX, PBX

- A. MMT
- B. KUU
- C. FBB
- D. GVV

Ans. D

Sol. Given series follows the pattern given below:

$$\begin{array}{ccccccccc} A & \xrightarrow{+3} & D & \xrightarrow{+3} & G & \xrightarrow{+3} & J & \xrightarrow{+3} & M & \xrightarrow{+3} & P \\ R & \xrightarrow{+2} & T & \xrightarrow{+2} & V & \xrightarrow{+2} & X & \xrightarrow{+2} & Z & \xrightarrow{+2} & B \\ T & \xrightarrow{+1} & U & \xrightarrow{+1} & V & \xrightarrow{+1} & W & \xrightarrow{+1} & X & \xrightarrow{+1} & Y \end{array}$$

Hence, option D is the correct answer.

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

- i. Treadmill
 - ii. Treason
 - iii. Treacherous
 - iv. Tread
- A. ii, iii, iv, i
 - B. iii, iv, ii, i
 - C. iii, iv, i, ii
 - D. i, ii, iii, iv

Ans. C

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

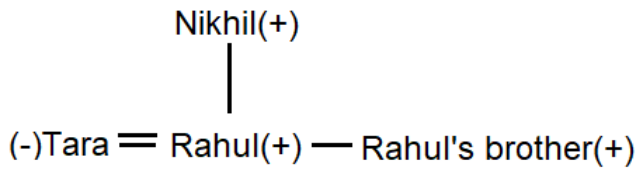
- iii. Treacherous
- iv. Tread
- i. Treadmill
- ii. Treason

Hence, option C is the correct response.

46. Nikhil is the father-in-law of Tara. Tara is the wife of Rahul. How is Rahul's brother related to Nikhil?
- A. Brother
B. Father
C. Son
D. Father-in-law

Ans. C

Sol.



Rahul's brother will be the son of his father, who is Nikhil.
Hence, option C is the correct answer.

47. In the following question, select the related group of letters from the given alternatives.
WD : TF :: TG : ?
- A. QR
B. IQ
C. QI
D. IP

Ans. C

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

And, if we observe the difference between the respective alphabet in the series given above:

$$W - 3 = T$$

$$D + 2 = F$$

Likewise,

$$T - 3 = Q$$

$$G + 2 = I$$

Hence, option C is the correct answer.

48. Read the following information and answer the questions given below it:

'A + B' means 'A is the son of B'.

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

'A × B' means 'A is the sister of B'.

'A ÷ B' means 'A is the brother of B'.

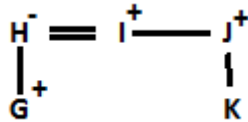
'A = B' means 'A is the father of B'.

In the expression $G + H - I \div J = K$, how is H related to K.

- A. Aunt
B. Mother
C. Nephew
D. Can't be determined

Ans. A

Sol.



K is the child of J who is I's brother which means I is the uncle of K.

Since H is the wife of I. therefore, H is the aunt of K.

Hence, option A is the correct answer.

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

Hardware : Mouse :: Software : ?

- A. Stylus
- B. Unix
- C. Mother Board
- D. CPU

Ans. B

Sol. A Mouse is hardware in the computer system. Similarly, Unix is the software in the computer system and others are hardware.

Hence, option B is the correct answer.

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

17, 32, 60, 114, 220, ?

- A. 598
- B. 490
- C. 430
- D. 394

Ans. C

Sol. Given series follows the pattern given below:

$$17 * 2 - 2 = 32$$

$$32 * 2 - 4 = 60$$

$$60 * 2 - 6 = 114$$

$$114 * 2 - 8 = 220$$

$$220 * 2 - 10 = 430$$

Hence, option C is the correct answer.

51. What is value of 1 light year?

- A. 1.46×10^{15} m
- B. 9.46×10^{15} m
- C. 5.50×10^{15} m
- D. $9:50 \times 10^{15}$ m

Ans. B

Sol. • A light-year is a unit of distance.

• The value of 1 light year is 9.46×10^{15} m.

• A light-year is the distance that light travels in vacuum in one Julian year.

52. What is the tenure of Judge in the International Court of Justice?

- A. 5
- B. 6
- C. 8
- D. 9

- Sol.
- The Reserve Bank of India (RBI) will launch a digital payments index (DPI) by July 2020.
 - This index will indicate the level of digitalization prevailing in the country.
 - Digital Payments Index (DPI) will help the regulator and government to understand the adoption of digital payments in the country.

57. Which of the following determines the nature of an enzyme?

- | | |
|------------|-----------------|
| A. Lipid | B. Vitamin |
| C. Protein | D. Carbohydrate |

Ans. C

- Sol.
- All known Enzymes are proteins molecule.
 - Enzymes are biological molecules that significantly speed up the rate of the chemical reactions that take place within cells.
 - They are vital for life and serve a wide range of important functions in the body, such as aiding in digestion and metabolism.

58. What is the starter of a fluorescent tubelight?

- | | |
|----------------|---------------|
| A. Transformer | B. Transistor |
| C. Capacitor | D. None |

Ans. C

- Sol.
- Capacitor is the starter of a fluorescent tubelight.
 - Capacitor and bimetallic contact inside the starter along with choke coil generate the high voltage across tube light to ionise the gas inside the tube and make it ON.

59. Which is the lower-most layer of the atmosphere?

- | | |
|-----------------|----------------|
| A. Exosphere | B. Mesosphere |
| C. Stratosphere | D. Troposphere |

Ans. D

Sol. Troposphere is the lower most layer of earth's atmosphere.

- It extends to 18km at Equator and 8kms at Poles.
- The temperature decreases as we go upward in Troposphere.
- The temperature decreases at the rate of 1 degree Celsius for every 165 m of height. This is called Normal Lapse Rate.

60. When is World Hypertension Day celebrated?

- | | |
|------------------|---------------|
| A. 23rd January | B. 17th May |
| C. 16th February | D. 14th April |

Ans. B

- Sol.
- World Hypertension day is celebrated annually on the 17th May.
 - It is celebrated to promote the public awareness of the importance of monitoring blood pressure with being aware of its natural levels.
 - World Hypertension Day 2019 was celebrated with the theme 'Know Your Number'.

61. Musoorie hill station is located in which hill range?
- A. Aravalli Range
B. Himalayan Range
C. Vindhya Range
D. Satpura Range

Ans. B

Sol.

- Mussoorie hill station is situated in Uttrakhand.
- The hill station is in the foothills of the Garhwal Himalayan range.
- Mussoorie is popularly known as the Queen of the Hills.

62. The 'Instrument of Accession' of Jammu and Kashmir State into the Union of India was signed by _____.

- A. Sheikh Abdullah
B. Farooq Abdullah
C. Hari Singh
D. Hanumant Singh

Ans. C

Sol. • The 'Instrument of Accession' of Jammu and Kashmir (J&K) state into the Union of India was signed by the Maharaja of J&K, Hari Singh.

• Pakistan entered into the standstill agreement but invaded Kashmir from north with an army of soldiers and tribesmen carrying weapons. In the early hours of 24th October, 1947, thousands of tribal pathans invaded Kashmir.

• On the very next day, Maharaja Hari Singh fled from Srinagar and arrived Jammu, where he signed the Instrument of Accession of J&K.

63. Which of the following element is not present in Gun Metal Alloy?

- A. Copper
B. Zinc
C. Tin
D. Iron

Ans. D

Sol. 1. Iron is not present in Gun Metal Alloy. Gun Metal contains -88% copper, 8–10% tin, 2–4% zinc and 1% Lead.

2. It has applications in making statues, making of valves, pumps, pipes etc and in making of bearings.

3. It can withstand atmospheric, steam, and seawater corrosion and due to which it has diverse applications.

64. Vienna is located on the banks of which river?

- A. Thaya river
B. Mur river
C. Gurk river
D. Danube river

Ans. D

Sol. • Vienna is the capital city of Austria.

• It is situated on the banks of the Danube river.

• Vienna is also described as Europe's cultural capital.

• The Danube river is the second-longest river in Europe.

• It begins in the Black Forest in Germany and flows east to the Danube Delta on the western coast of the Black Sea.

69. Which Article of the Indian Constitution mentions about financial emergency?

- A. 360
- B. 350
- C. 340
- D. 330

Ans. A

Sol.

- Article 360: Provisions as to financial emergency.
- If the President is satisfied that a situation has arisen whereby the financial stability or credit of India or of any part of the territory thereof is threatened, he may by a Proclamation make a declaration to that effect.

70. On February 6, 2020, The President of India Ram Nath Kovind presented the International Gandhi Awards for Leprosy to_____.

- A. Dr. Ravi Sen
- B. Surendra Bhargava
- C. Dr. N.S. Dharmashaktu
- D. Dr. M.V. Subramanian

Ans. C

Sol. • The President of India Ram Nath Kovind presented the International Gandhi Awards for Leprosy to Dr. N.S. Dharmashaktu.

- President awarded him under the Individual category and The Leprosy Mission Trust under the institutional category on 6 February 2020.
- Followed by Brazil and Indonesia, India has the highest number of new leprosy cases in the world.

71. What is the focal length of a lens if its power is -4:

- A. 4 m
- B. -0.25 m
- C. -40 m
- D. -25 m

Ans. B

Sol. • Power of a lens is the reciprocal of focal length that is expressed in metres

i.e. $P = 1/f$, where P =Power and f = Focal length

$$\rightarrow f = 1/P$$

$$\rightarrow f = 1/(-4) = -0.25 \text{ m}$$

72. What is full form of FRBMA?

- A. Financial Responsibility and Budget Management Act
- B. Financial Reinforcement and Budget Management Act
- C. Fiscal Responsibility and Budget Management Act
- D. Financial Responsibility and Budget Monitoring Act

Ans. C

Sol. •FRBMA stands fo rFiscal Responsibility and Budget Management Act

- The Fiscal Responsibility and Budget Management Act, 2003 (FRBMA) was passed in 2003 with an aim to reduce India's fiscal deficit, institutionalize financial discipline, improve macroeconomic management of budget and strengthen fiscal prudence.

77. Tawa project is a river project, located in which state of India?

- A. Tamil Nadu
B. Andhra Pradesh
C. Telangana
D. Madhya Pradesh

Ans. D

Sol. • Tawa Reservoir is a reservoir on the Tawa River in central India.
• It is located in Itarsi of Hoshangabad District of Madhya Pradesh.
• The reservoir was formed by the construction of the Tawa Dam.
• Its construction was started in 1958 and was completed in 1978.
• Tawa Reservoir forms the western boundary of Satpura National Park and Bori Wildlife Sanctuary.

78. Pravasi Bhartiya Kendra to be renamed as_____.

- A. Arun Jaitley Bhartiya Pravasi Kendra
B. Sardar Patel Pravasi Kendra
C. Sushma Swaraj Bhawan
D. Swaraj Kendra

Ans. C

Sol. • In February 2020, the Government of India renamed Pravasi Bhartiya Kendra in New Delhi as Sushma Swaraj Bhawan.
• Government has also renamed the Foreign Service Institute to Sushma Swaraj Institute of Foreign Service.
• After Indira Gandhi, Sushma Swaraj was the second woman to hold the External Affairs Ministry. She was popularly known as the People's Minister.

79. Who was the First woman union minister?

- A. Vijayalakshmi Pandit
B. Amrit Kaur
C. Gayatri Devi
D. Indira Gandhi

Ans. B

Sol. • Amrit Kaur was the First Woman Union Minister.
• She was the first health minister of India and served for ten years in the capacity.
• She was a part of Constituent Assembly and a member of Sub-Committee on Fundamental Rights and Sub-Committee on Minorities.
• In 1950, she was elected the president of the World Health Assembly.

80. Kunwar Singh led the revolt of 1857 in which state?

- A. Maharashtra
B. Bengal
C. Bihar
D. Punjab

Ans. C

Sol. * Kunwar Singh led the Indian Rebellion of 1857 in Bihar.

* He led a select band of armed soldiers against the troops under the command of the British East India Company.

* He was the chief organiser of the fight against the British in Bihar.

81. Knot is a unit of which of the following quantity?

- | | |
|-------------|-------------|
| A. Distance | B. Velocity |
| C. Force | D. Torque |

Ans. B

Sol. Knot is a unit of speed which is equal to nautical mile per hour.

- The knot is a non-SI unit.
- The ISO standard symbol for the knot is kn.
- Nautical miles and knots are convenient units to use when navigating an aircraft or ship.

82. Who married the Lichchhavi princess Kumara Devi?

- | | |
|-------------------|--------------------|
| A. Srigupta | B. Samudragupta |
| C. Chandragupta I | D. Chandragupta II |

Ans. C

Sol. Chandragupta I (AD 319-335) married the Lichchhavi princess Kumara Devi.

- He issued the coins in the joint names of himself, his queen Kumara Devi and the Lichchhavi nation which was known as 'Dinaras'.
- He also issued gold coins in his period.
- He was the first Gupta king to adopt the title of Maharajadhiraj.
- He was the first important king of Gupta dynasty.

83. Rh factor of blood groups was discovered by _____.

- | | |
|----------------------------|---------------------------|
| A. Weiner and Treviranus | B. Landsteiner and Demock |
| C. Landsteiner and Johnson | D. Landsteiner and Wiener |

Ans. D

Sol. • Rh factor of blood groups was discovered by Landsteiner and Wiener in 1937.

- The term "Rh" was originally an abbreviation of "Rhesus factor."
- Since that time a number of distinct Rh antigens have been identified, but the first and most common one, called RhD, causes the most severe immune reaction and is the primary determinant of the Rh trait.

84. The recent Defence Expo,2020 held at which place?

- | | |
|------------|------------|
| A. Chennai | B. Pune |
| C. Bhopal | D. Lucknow |

Ans. D

Sol. Recently the 11th edition of Defence Expo was held at Lucknow, from 5th to 9th February, 2020.

- The 10th edition of Def Expo was held in Chennai in 2018.
- The Defence Expo is a presentation and exhibition of new technologies, technological solutions, and it is attended by international dignitaries.
- One of the two Defence Industrial Corridors (DICs) of India is planned in Uttar Pradesh. The other DIC is proposed in Tamil Nadu.
- The fifth India Russia Military Industry Conference was held on the sidelines of the event.

85. In Rajiv Gandhi Khel Ratan Award, the cash incentive awarded in lakh?

- A. 5
- B. 7
- C. 7.5
- D. 9.5

Ans. C

Sol. In Rajiv Gandhi Khel Ratan award a cash incentive of 7.5 lakh rupees is awarded.

- Rajiv Gandhi Khel Ratan award is the highest sports honour in country.
- It was started in 1991-92, and in 2019 Bajrang punia and Deepa Malik was given the award.
- It is awarded annually by the Ministry of Youth Affairs and Sports.
- The first recipient of the award was Chess Grandmaster Viswanathan Anand.

86. In January 2020, which of the following state government launched the Amma Vodi scheme?

- A. Tamil Nadu
- B. Karnataka
- C. Odisha
- D. Andhra Pradesh

Ans. D

Sol. • On 9th January 2020, the Andhra Pradesh State government launched the Amma Vodi scheme.

- Amma Vodi can be translated as 'mother's lap' in Telugu.
- The scheme will be implemented on 26 January 2020.
- Under the scheme, mothers and guardians of school-going children from lower-income groups will receive financial assistance of Rs.15,000 annually.

87. The Shanghai Cooperation Organization has how many members?

- A. 5
- B. 6
- C. 7
- D. 8

Ans. D

Sol. The Shanghai Cooperation Organization has 8 members.

- The current members of SCO are given below as follows:

Kazakhstan

Kyrgyzstan

Tajikistan

Uzbekistan

Russia

China

India

Pakistan

- SCI was established in 2003 and its headquarters are located at Beijing.
- India and Pakistan joined SCO as full members on 9 June 2017 at a summit in Astana, Kazakhstan.

88. Saga Dawa festival is celebrated in which state?

- A. Nagaland
B. Sikkim
C. Uttarakhand
D. Tamil Nadu

Ans. B

Sol. Saga Dawa festival is celebrated in Sikkim.

- It is celebrated on full moon day of Saga Dawa month of Tibetan Calendar.
- The Saga Dawa month falls between May and June and is known as 'Month of Merits'.
- The festival is celebrated to commemorate the birth, life and death of Buddha.
- The communities who celebrate this festival have to follow three teachings during the month- Generosity, Morality and Meditation.

89. What is the chemical name of slaked lime?

- A. Calcium Nitrate
B. Sodium Chloride
C. Calcium Oxide
D. Calcium Hydroxide

Ans. D

Sol. Calcium hydroxide is also called slaked lime. Its chemical formula is $\text{Ca}(\text{OH})_2$.

- It is a colorless crystal or white powder, and produced when quicklime is mixed, or slaked with water.

90. 'British India Society' was founded by _____.

- A. William Jones
B. William Adam
C. Raja Ram Mohan Roy
D. Dwarkanath Tagore

Ans. B

Sol. British India Society was founded in 1839 by William Adam.

- In 1841, the society started printing a newspaper 'British Indian Advocate'.
- With Efforts of George Thomson, Bengal British India Society was founded in 1843.
- The idea was to secure the welfare, and advance the interests of all classes.

91. The new coronavirus is officially named as _____ by World Health Organization (WHO).
- A. Covid-19
 - B. Virus-2020
 - C. DFH-88
 - D. Corona-18

Ans. A

Sol. • The World Health Organization (WHO) has officially named the new coronavirus as Covid-19.

- It is the shortened version of coronavirus disease 2019.
- Coronavirus was first identified in the 1960s.
- This virus can infect both humans and animals.

92. Human Development Index is released by?

- A. UNDP
- B. WB
- C. IMF
- D. WEF

Ans. A

Sol. The Human Development Index is developed by United Nations Development Programme.

- It is a part of Human Development Report published by UNDP.
- The focus of the 2019 Report is on 'Inequality in Human Development'.
- Human development index is measured on the basis of three basic dimensions, which are-

A long and healthy life,

Access to knowledge, and

A decent standard of living.

93. Which of the following state government will issue a separate identity card for the transgender community?

- A. Rajasthan
- B. Kerala
- C. Maharashtra
- D. Uttar Pradesh

Ans. A

Sol. • Rajasthan state government will issue a separate identity card for the transgender community.

- The move aims to support the transgender community to get the benefit of government jobs and all government schemes.
- The announcement was made by the Social Justice and Empowerment Minister Master Bhanwarlal Meghwal in February 2020.

94. Which of the following city is the capital of Hungary?

- A. Berlin
- B. Riga
- C. Budapest
- D. Prague

Ans. C

Sol. * The capital of Hungary is Budapest.

* Hungary is a European country. Budapest is the most populous city of Hungary,

* The Great Hungarian Plain lies in it and it includes 56% of the country's total land.

* It is an Alpha – global city with strengths in commerce, finance, media, art, fashion, research, technology, education, and entertainment.

95. The 43rd session of the governing council of the International Fund for Agricultural Development (IFAD) was held in _____.

A. New Delhi

B. Tokyo

C. Rome

D. Dhaka

Ans. C

Sol. • The 43rd session of the governing council of the International Fund for Agricultural Development (IFAD) was held in Rome, Italy.

• It was held from 11-12 February 2020.

• The theme of the session is "Investing in sustainable food systems to end hunger by 2030".

• IFAD was established in 1974 at the World Food Conference.

96. What is the full form of HTTP?

A. Hardware Transfer Protocol

B. Hypertext Transfer Printer

C. Hyper tool Transfer Protocol

D. Hypertext Transfer Protocol

Ans. D

Sol. • The full form of HTTPS is Hypertext Transfer Protocol Secure.

• HTTP is used for secure communication over a computer network. The protocol is also referred as TLS. Netscape Communications created HTTPS in 1994 for its Netscape Navigator web browser.

• HTTPS connections were primarily used for payment transactions on the World Wide Web, e-mail and for sensitive transactions in corporate information systems.

97. What is the rank of India in Democracy Index 2019?

A. 41st

B. 42nd

C. 58th

D. 51st

Ans. D

Sol. • India ranked 51st in the Democracy Index 2019.

• The index is based on the functioning of government, electoral process and pluralism, civil liberties, political participation, and political culture.

• Norway topped EIU's index with a score of 9.87.

• The Democracy Index is prepared by a UK-based company Economist Intelligence Unit (EIU).

98. Which of the following was NOT a part of the 'Navratna' at Vikram Aditya's court?

- A. Surdas
B. Vararuchi
C. Kshapandka
D. Kalidasa

Ans. A

Sol. * The Navratans of Vikramaditya's court are nine novel courtiers representing different fields of excellence. Mughal emperor Akbar also had nine jewels or navaratan in his court.

* The Navratans present in Vikramaditya's were -Amarasimha, Dhanvantari, Ghatakarpara, Kalidasa, Kshapanaka, Shanku, Varahamihira, Vararuchi and Vetala-Bhatta.

* Kalidas was eminent classical Sanskrit scholar. Malavikagnimitram and Abhijnanasakuntalam are two of his best works.

* Kālidāsa is the author of two epic poems, Raghuvamsha and Kumārasambhava.

99. Who is known as the father of Modern Hindi Literature?

- A. Premchand
B. Hazari Prasad Dwivedi
C. Ramdhari Singh Dinkar
D. Bhartendu Harishchandra

Ans. D

Sol. Bhartendu Harishchandra is known as the father of modern Hindi Literature.

- His major poetry creations are- Bhakta Sarvagya, Prem Malika, Madhumukul, Varsha Vinod, Vinay prem Pachasa etc.

- The period from 1857 to 1900 is known as the Bharatendu era due to the vast literary contribution of Bharatendu.

- He wrote: "Andher Nagari, Chaupat Raja, taka ser bhaaji, take ser khaja".

100. Which is the smallest cell in human body?

- A. Sperm cell
B. Ovum cell
C. Nerve cell
D. Blood cell

Ans. A

Sol. • Sperm cell is the smallest cell in human body. Sperm cells are gametes that are produced in the testicular organ of male human being.

- Sperm cells carry a total of 23 chromosomes that are a result of a process known as meiosis. The general morphology of sperm cells consists of the following parts:

- a) Distinctive head
- b) Midpiece (body)
- c) Tail

101. Match the following with parts in List-I with machines in List-II

List-I

- p. damper bars
- q. rotor bars
- r. commutator

List-II

- 1) Dc machine
- 2) Synchronous machine
- 3) Induction machine

A. p-1 q-2 r-3

B. p-3 q-1 r-2

C. p-2 q-3 r-1

D. p-3 q-2 r-1

Ans. C

Sol. Damper Bars: Damper bars are used in synchronous machines.

Rotor bars: Rotor bars are used in induction machines

Commutator: Commutator used in DC machines which convert the AC output of armature into DC.

102. The internal resistance of an ideal voltage source is

A. Infinity

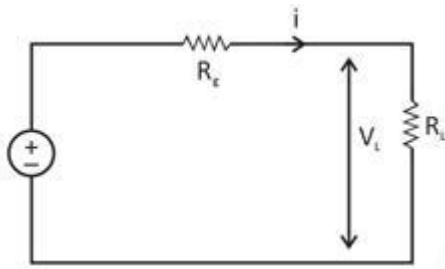
B. Zero

C. Very small approaching zero

D. Very large approaching infinity

Ans. B

Sol.



For the ideal voltage source, the total input voltage should be comes across the load resistance, which is only possible when there is no voltage drop across R_g i.e., R_g should be equal to zero.

103. The current $i(t)$ through a 10Ω resistor in series with an inductance is given by

$$i(t) = 3 + 4\sin(100t + 45^\circ) + 4\sin(300t + 60^\circ) \text{ A}$$

The RMS value of the current and the power dissipated in the the circuit are respectively

A. 5A and 150 W

B. 11A and 250 W

C. 5A and 250 W

D. 11A and 150 W

Ans. C

Sol. RMS value of current

$$\begin{aligned}
 i_{rms} &= \sqrt{3^2 + \left(\frac{4}{\sqrt{2}}\right)^2 + \left(\frac{4}{\sqrt{2}}\right)^2} \\
 &= \sqrt{25} \\
 &= 5 \text{ A}
 \end{aligned}$$

$$\therefore \text{Power dissipated} = i_{rms}^2 R$$

$$= 25 \times 10$$

$$= 250 \text{ Watts}$$

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104. Which of the following semiconductor compound is not used in the construction of Light Emitting Diodes?

- A. GaAs
- B. GaP
- C. GaSe
- D. GaN

Ans. C

Sol. GaSe compound does not exist .

105. A 4-pole 50 Hz, 3Φ induction motor is running at 1440 rpm. What will be speed of stator magnetic field with respect to rotor?

- A. 1500 rpm
- B. 60 rpm
- C. 2940 rpm
- D. Zero

Ans. B

Sol. $P = 4, f = 50 \text{ Hz}, N_r = 1440 \text{ rpm}.$

$$N_s = \frac{120 \times f}{P} = \frac{120 \times 50}{4} = 1500 \text{ rpm}$$

Speed of stator magnetic field with respect to rotor = $N_s - N_r$
 = $1500 - 1440 = 60 \text{ rpm}.$

106. Which of the following statements are correct for an ideal constant voltage sources ?

- 1) Its output voltage remains absolutely constant whatever the change in load current.
- 2) It possesses zero internal resistance so that internal voltage drop in the source is zero.
- 3) Output voltage provided by the source would remain constant irrespective of the amount of current drawn from it.
- 4) Output voltage provided by the source varies with the amount of current drawn from it.

- A. 1, 2 and 4 only
- B. 1, 3 and 4 only
- C. 2, 3 and 4 only
- D. 1, 2 and 3 only

Ans. D

Sol. For ideal constant voltage source

Internal resistance $r = 0$

We know that

$$E = V - ir$$

$E = V$ output voltages is independent so current.

Internal voltage drop = ir

$$= 0$$

Statements 1, 2 and 3 are correct.

107. The locus of constant received power is a circle of radius

- A. $\frac{|V_s - V_R|^2}{|B|}$
- B. $\frac{|V_s|^2}{|B|}$
- C. $\frac{|V_s||V_R|}{|B|}$
- D. $\frac{|V_R|^2}{|B|}$

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Ans. C

Sol. The locus of constant received power is a circle of radius is given as $\frac{|V_s||V_R|}{|B|}$.

108. A three-phase generator consisting of three conductive loops separated by _____
- A. 60°
 - B. 120°
 - C. 180°
 - D. 360°

Ans. B

Sol. So, three conductive loops are separated by 120°.

109. _____ should be provided as the working space around the main switchboard according to IE rule 51.
- A. 0.914 m
 - B. 0.638 m
 - C. 0.814 m
 - D. 0.529 m

Ans. A

Sol. 0.914 m should be the length which is provided as the working space around the main switchboard according to IE rule 51.

110. An inductor of inductance 0.1 H, carrying current of 6 Amps will store energy of
- A. 6 Joules
 - B. 36 Joules
 - C. 1.8 Joules
 - D. 3.6 Joules

Ans. C

Sol. $E_L = 0.5 L I^2$
 $E_L = 0.5 (0.1)(6)^2$
 $E_L = 0.5 (3.6)$
 $E_L = 1.8 J$

111. Which of the following is not a type of arc welding ?
- A. Submerged
 - B. Plasma
 - C. Air-acetylene
 - D. Electro-slag

Ans. C

Sol. Air-acetylene is not an example of arc welding.

112. A conductor carries more current on the surface as compared to core. This is called as
- A. Permeability
 - B. Corona effect
 - C. Skin effect
 - D. Unsymmetrical fault

Ans. C

Sol. Skin effect is defined as the tendency of a high-frequency alternating current to flow through only the outer layer of a conductor.

113. In a full wave rectifier with input frequency of 50 Hz, the frequency of the output is:
- A. 50 Hz
 - B. 100 Hz
 - C. 150 Hz
 - D. 200 Hz

Ans. B

Sol. In a full wave rectifier, the output frequency is double the input frequency, i.e.,

$$f_{out} = 2f_{in}$$

When $f_{in} = 50 \text{ Hz}$, output frequency,

$$f_{out} = 2 \times 50 = 100 \text{ Hz}$$

114. In a DC circuit breaker, the current interruption and arc quenching is obtained by:

- A. natural zero current interruption
- B. low-resistance interruption
- C. high-resistance interruption
- D. increasing the arc current

Ans. C

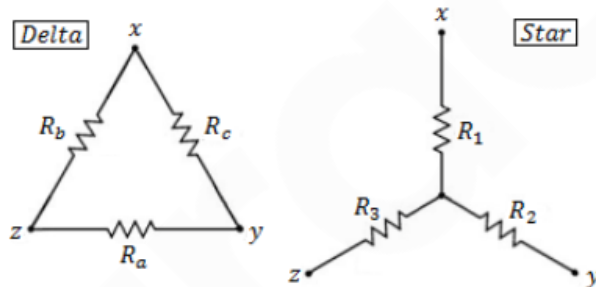
Sol. In high interruption method we can increase the electrical resistance many times to such a high value that it force the current to reach to zero and thus restricting the possibility of arc being restruck. Proper steps must be taken in order to ensure that the rate at which the resistance is increased or decreased is not abnormal because it may lead to generation of harmful induced voltage in the system.

115. A balanced load of $5 + j4$ is connected in delta. What is the impedance per phase of the equivalent star connection?

- A. $5 + j4$
- B. $1.66 + j1.33$
- C. $15 + j12$
- D. $2.5 + j2$

Ans. B

Sol.



$$R_a = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_1} \quad R_1 = \frac{R_b R_c}{R_a + R_b + R_c}$$

$$R_b = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_2} \quad R_2 = \frac{R_a R_c}{R_a + R_b + R_c}$$

$$R_c = \frac{R_1 R_2 + R_2 R_3 + R_3 R_1}{R_3} \quad R_3 = \frac{R_a R_b}{R_a + R_b + R_c}$$

Since it is given that $R_a = R_b = R_c = Z$ Let it is equals to Z .

$$\text{So, } Z_1 = Z_2 = Z_3 = (Z \cdot Z) / (Z + Z + Z) = Z/3$$

$$= (5 + j4) / 3$$

$$= (1.66 + j 1.33)$$

116. If the secondary voltage is one-third of the primary voltage in a transformer, what is the secondary current?
- A. Same as the primary current
 - B. One-third of the primary current
 - C. Three times the primary current
 - D. Nine times the primary current

Ans. C

Sol. We know that

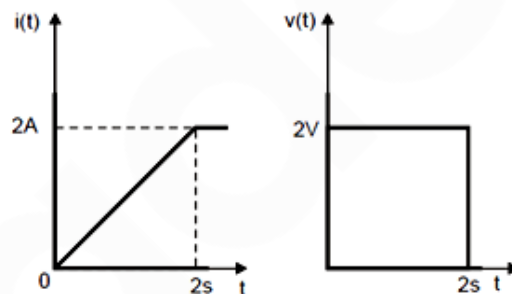
$$\frac{V_2}{V_1} = \frac{I_1}{I_2} = \frac{N_2}{N_1}$$

Given that $\frac{V_2}{V_1} = \frac{1}{3}$

$$\frac{1}{3} = \frac{I_1}{I_2}$$

$$I_2 = 3I_1$$

117. The voltage and current waveforms for an element are shown in the figure



The circuit element and its value are :

- A. Capacitor, 2F
- B. Inductor, 2H
- C. Capacitor, 0.5F
- D. Inductor, 0.5H

Ans. B

Sol. From current waveform $di(t)/dt=1$

And from voltage waveform $V(t)=2$

Let, $V(t)= X di(t)/dt$; X=unknown element

This is similar to $V= L di/dt$

So, unknown element $X= L$ inductor

$$L= V/(di(t)/dt) = 2/1 = 2 \text{ Henry}$$

118. Rectification efficiency of a full-wave rectifier without filter is nearly equals to:

- A. 51%
- B. 61%
- C. 71%
- D. 81%

Ans. D

Sol. Full wave rectifier converts A.C to D.C voltage, and makes use of both the half cycles of input A.C signal. Generally capacitor filter is used in full wave rectifiers. When the capacitor is removed, Efficiency comes around 81% and ripple factor 0.48.

119. If for an IDMT relay with a plug setting of 50% and a CT ration of 400/5, the current is 3000 A, then the plug setting multiplier would be:

- A. 7.5
- B. 15.0
- C. 18.75
- D. 37.5

Ans. B

Sol.

$$PSM = \frac{\text{Fault Current}}{\text{Current setting} \times \text{CT secondary rated current} \times \text{CT ratio}}$$

$$PSM = \frac{3000}{0.5 \times 5 \times \frac{400}{5}}$$

$$PSM = 15$$

120. The corona loss on a particular system at 50 Hz is 1 KW/Km per phase. What is the corona loss at 60 Hz in KW/Km per phase?

- A. 0.83
- B. 1
- C. 1.13
- D. 1.2

Ans. C

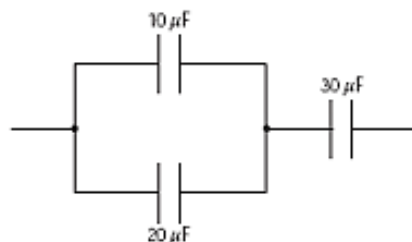
$$\text{Sol. Corona loss} = 241 \times 10^5 \times \frac{(f+25)}{\delta} \times \sqrt{\frac{r}{d}} \times (V_{pn} - V_c)^2$$

$$\therefore \text{Corona loss} \propto (f+25)$$

$$\frac{P_1}{P_2} = \frac{f_1 + 25}{f_2 + 25}$$

$$P_2 = \frac{(60 + 25)}{(50 + 25)} \times 1 = 1.13 \text{ kW / km}$$

121. If two capacitors C₁ = 10 μF and C₂ = 20 μF are connected in parallel with third capacitor C₃ = 30 μF in series, then the equivalent capacitance results as:



- A. 25μF, 8μF
- B. 30μF, 15μF
- C. 40μF, 8μF
- D. 30μF, 11μF

Ans. B

Sol. First calculate the two capacitors which are in parallel:

$$C_1 = 10 \mu\text{F} + C_2 = 20 \mu\text{F}$$

$$C_{12} = 30 \mu\text{F}$$

Considering expression $C=C_1 + C_2 + C_3$ and on combining this with other capacitor in series:

$$1/C = 1/C_1 + 1/C_2 + 1/C_3$$

$$1/C = 1/30 \mu\text{F} + 1/30 \mu\text{F}$$

$$= 2/30 \mu\text{F}$$

$$C = 15 \mu\text{F}$$

Now,

$$1/C = 1/C_1 + 1/C_2$$

$$1/C = 1/30\mu\text{F} + 1/30\mu\text{F}$$

$$1/C = 2/30\mu\text{F}$$

$$C = 30\mu\text{F} / 2$$

$$C = 15\mu\text{F}$$

122. In a three unit insulator string, voltage across lowest unit is 17.5 KV and lowest string efficiency is 84.28%. What is the total voltage across the string?

A. 8.825 KV

B. 44.25 KV

C. 88.25 KV

D. 442.5 KV

Ans. B

Sol. String efficiency = $\frac{\text{Total voltage across string}}{n \times \text{voltage across lowest unit}}$

n = number of insulator string

$$\text{Total voltage} = 0.8428 \times 3 \times 17.5 = 44.25 \text{ kV}$$

123. The time constant of a series R - L combination electric circuit is given by

A. L^2R

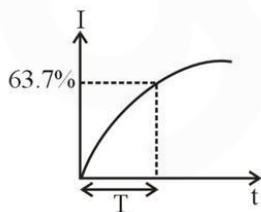
B. LR^2

C. LR

D. $\frac{L}{R}$

Ans. D

Sol.



The time constant of an R-L circuit is defined as the time required to reach the current to 63.7% of its maximum value where time constant

$$\tau = \frac{L}{R}$$

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124. The major cause for creeping in energy-meter is:

- A. Over compensation for friction
- B. Vibrations
- C. Stray magnetic fields
- D. Excessive voltage across the potential coil.

Ans. A

Sol. The major cause of creep is over compensation for friction. Other causes of creeping are excessive voltage across the PC (which causes excessive friction compensating torque is developed), vibrations and stray magnetic fields.

125. Which of the following is an advantage of bundle conductors as compared to single conductor?

- A. Reduce skin effect
- B. Lower level of reactance
- C. Reduce line losses due to faster cooling
- D. All the above

Ans. D

Sol. Advantages of bundled conductors are-

- 1) Bundling of conductors leads to reduction in line inductance.
- 2) Ability to reduce corona discharge.
- 3) Reduction in the formation of corona discharge leads to less power loss and hence improved transmission efficiency of the line.
- 4) Reduction in communication line interference due to reduction in corona.
- 5) As the bundled conductors have more effective surface area exposed to air, it has better and efficient cooling and hence better performance compared to a single conductor.
- 6) The current carrying capacity of bundled conductors is much increased in comparison to single large conductor owing to reduced skin effect.

126. The field control of a dc shunt motor gives speed control,

- A. Above normal speed.
- B. Below normal speed.
- C. Above and below normal speed.
- D. A multiple of normal speed.

Ans. A

Sol. Field control method of speed control of D.C. shunt gives speed control above normal speed.

127. Which of the following is true with auto transformer?

- A. It has only one winding
- B. It adjusts automatically as a "step-down" or "step-up" transformer depending on the use
- C. Both A and B
- D. None of these

Ans. A

Sol. An autotransformer is an electrical transformer with only one winding. The "auto" prefix refers to the single coil acting alone, not to any kind of automatic mechanism. In an autotransformer, portions of the same winding act as both the primary and secondary sides of the transformer. In contrast, an ordinary transformer has separate primary and secondary windings which are not electrically connected.

128. N resistors each of resistance R when connected in series offer an equivalent resistance of 50Ω and when reconnected in parallel the effective resistance is 2Ω . The value of R is
- A. 2.5Ω
 - B. 5Ω
 - C. 7.5Ω
 - D. 10Ω

Ans. D

Sol. $NR = 50\Omega$ (when connected in series).....(1)
 $R/N = 2$ (when connected in Parallel).....(2)
 By equation (1) & (2)
 $NR.R/N = 50 \times 2$
 $R^2 = 100$
 $R = 10$

129. The load torque vs speed characteristic of an industrial load is given below

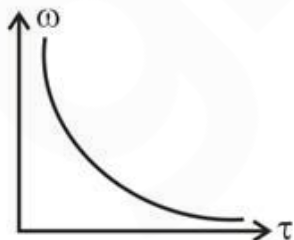


The motor suitable for the above load is

- A. dc shunt motor
- B. 3 phase induction motor
- C. dc series motor
- D. capacitor motor

Ans. C

Sol.



The given characteristic is the speed-torque characteristic of D.C. series motor.

- (i) At no load speed is very large
- (ii) since at slanting the speed of the motor is large enough so that series motor is not starter without any load put on it.

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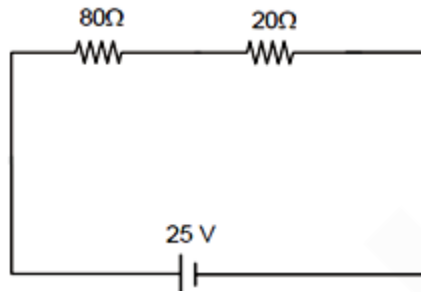
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130. The arc utilized in electric arc welding is a
- A. High voltage, high current discharge
 - B. Low voltage, low current discharge
 - C. Low voltage, high current discharge
 - D. High voltage, low current discharge

Ans. C

Sol. The arc utilized in electric arc welding is a low voltage and high current discharge type.

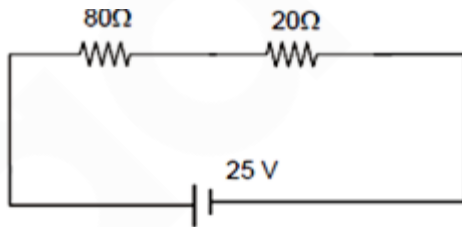
131. What is the potential drop across 80 ohm the resistor in the figure?



- A. 20 V
- B. 15 V
- C. 10 V
- D. 5 V

Ans. A

Sol.



Voltage across 80 ohm resistance, $V_{80\text{ohm}} = 80 / (80 + 20) \times 25 = 20 \text{ V}$

132. For an R-L-C series circuit in resonance, which of the following statement is not correct.
- A. The current is maximum at Resonce in series R-L-C circuit.
 - B. The Power factor at the resonance is unity.
 - C. Current is minimum at Resonance in series R-L-C circuit.
 - D. Circuit Impedence at resonance = Circuit Resistance

Ans. C

Sol. In a series RLC circuit, at resonance the voltage drops across the capacitance and inductance are equal in magnitude. But in Phase Opposition so the impedance will be minimized at resonance hence the current at the resonance is maximum.& the Power Factor at Resonance is Unity.

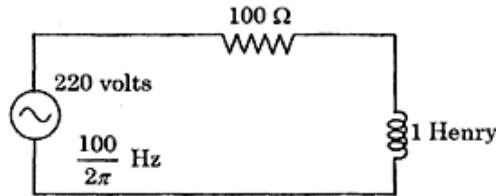
133. In thermal power plants, steam energy is converted into mechanical energy by means of a:

- A. Boiler
- B. Condenser
- C. Steam turbine
- D. Reactor

Ans. C

Sol. A steam turbine is a device that extracts thermal energy from pressurized steam and uses it to do mechanical work on a rotating output shaft. Its modern manifestation was invented by Sir Charles Parsons in 1884.

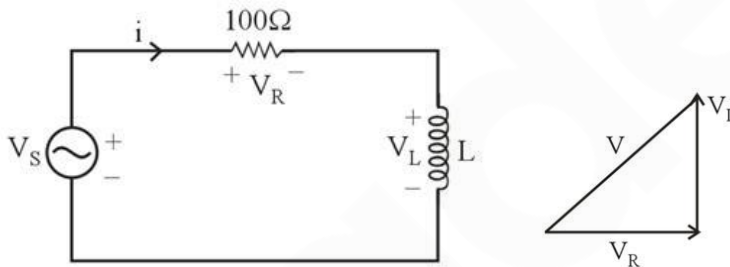
134. In the given circuit below, the voltage across the inductor is



- A. $\frac{220}{\sqrt{2}}$ volts
- B. $220\sqrt{2}$ volts
- C. 220 volts
- D. 110 volts

Ans. A

Sol.



$$V_s = 220 \text{ V}$$

$$V_R = V_L \Rightarrow \because \{X_L = R\}$$

$$\therefore V_L = \sqrt{V^2 - V_R^2}$$

$$V_L^2 = V^2 - V_R^2 \Rightarrow V^2 = 2V_L^2$$

$$\text{ie., } V_L = \frac{V}{\sqrt{2}} = \frac{220}{\sqrt{2}} \text{ volt}$$

135. A series resonant circuit is tuned to 10 MHz and provides 3-dB bandwidth of 100 kHz. The quality factor Q of the circuit is

- A. 30
- B. 1
- C. 100
- D. 10

Ans. C

Sol. For series resonant circuit

$$Q = \frac{f_0}{BW} = \frac{10 \times 10^6}{100 \times 10^3} = 100$$

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136. By using guard ring in a transmission line, its string efficiency will be

- A. increase
- B. decrease
- C. constant
- D. none of the above

Ans. A

Sol. Guard ring serves two purposes

- A. Equalization of voltage drop across the units
- B. Protect the insulator strings from the flashover whenever over-voltage occurs between the tower structure and the power conductor.
- C. Due to this string efficiency increases.

137. In which of these is reverse recovery time nearly zero?

- A. Zener diode
- B. Tunnel diode
- C. Schottky diode
- D. PIN diode

Ans. C

Sol. When a diode is conducting in a forward-bias direction, and is suddenly switched to the reverse-bias direction, the diode will conduct for a short time in the reverse direction, till the reverse current becomes zero. This time taken by the diode to switch from the conducting state to the non-conducting state is known as the reverse recovery time. In case of a Schottky diode, there is no charge carrier depletion region at the junction. Hence, a Schottky diode takes no time to switch between the conducting state and non-conducting state. Thus, the reverse recovery time of a Schottky diode is nearly diode.

138. Which damping is used in moving iron instrument ?

- A. Air friction damping
- B. Eddy current damping
- C. Fluid friction damping
- D. Electromagnetic damping

Ans. A

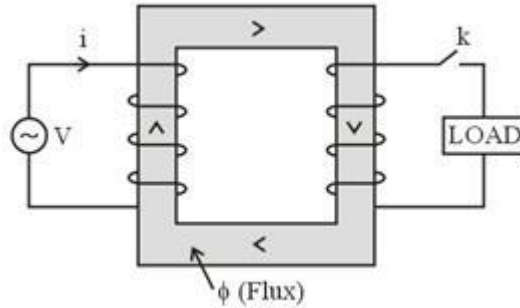
Sol. In moving iron instrument the damping which is used in Air friction damping, by a vane moving in a sector shaped chamber.

139. The main purpose of using core in a transformer is to

- A. decrease iron losses
- B. eliminate magnetic hysteresis
- C. reduce reluctance of the common magnetic circuit
- D. prevent eddy current loss

Ans. C

Sol.



By the use of magnetic core, flux linking in between primary and secondary case to flow. Core at the transformer help to provide magnetic path by reducing the reluctance of the common magnetic circuit.

140. What will be the chording angle to eliminate 5th harmonics of induced voltage in a distributed 3 - Φ synchronous machine?

- A. 54°
- B. 30°
- C. 60°
- D. 36°

Ans. D

Sol. To eliminate the nth harmonic induced voltage chording angle

$$\alpha = 180 / n$$

$$\therefore \alpha = 180 / 5 = 36^\circ$$

141. A voltage and current waveform of an element below.

$$V(t) = 120 \sin (3t + 120^\circ)$$

$$I(t) = 20 \cos (3t - 60^\circ)$$

The element is

- A. Pure inductor, $L = 2H$
- B. Pure capacitor $C = \frac{1}{18}F$
- C. Resistance of 3Ω in series with inductor of $L = 1 H$
- D. Resistance of 3Ω in series with capacitor of $C = \frac{1}{3}F$

Ans. A

Sol. $V(t) = 120 \cos (3t + 120^\circ - 90^\circ)$; $V(t) = 120 \cos (3t + 30^\circ)$

$$I(t) = 20 \cos (3t - 60^\circ)$$

$$Z = \frac{V}{I} = \frac{120 \angle 30^\circ}{20 \angle -60^\circ}$$

$$Z = j6 \Omega \text{ wL} = 6$$

$$L = \frac{6}{\omega} = \frac{6}{3} = 2H$$

$$L = 2H$$

142. The Eddy current loss is proportional to the

- A. Frequency
- B. Square of the frequency
- C. Cube of the frequency
- D. Square root of the frequency

Ans. B

Sol. Eddy current loss in a transformer is fixed, and it depends on the core material's magnetic properties. Eddy current loss is given as:

$$W_e = PB_{\max}^2 f^2 t^2 \text{ watt}$$

So definitely answer is option (b)

143. The type of dc generator used for arc welding purposes is a

- A. series generator
- B. shunt generator
- C. Cumulatively compound generator
- D. differentially compound generator

Ans. D

Sol. Differentially compound DC generator is used for arc welding process.

144. The relationship between electric field strength (\vec{E}) and the potential difference (V) at any point is given by

- A. $\vec{E} = \nabla \bar{a}_r$
- B. $\vec{E} = -\nabla V$
- C. $V = \nabla \cdot \vec{E}$
- D. $\vec{E} = \nabla \times \nabla V$

Ans. B

Sol. $\vec{E} = -\nabla V$

145. The velocity at which a sinusoidal signal of 10^9 rad/s travels down a loss-less transmission line for which $L = 0.4 \mu\text{H/m}$ and $C = 40 \text{ pF/m}$ is

- A. $2.3 \times 10^8 \text{ m/s}$
- B. $2.5 \times 10^8 \text{ m/s}$
- C. $5 \times 10^9 \text{ m/s}$
- D. $4.5 \times 10^9 \text{ m/s}$

Ans. B

Sol.
$$v_p = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{0.4 \times 10^{-6} \times 40 \times 10^{-12}}}$$
$$= 2.5 \times 10^8 \text{ m/sec}$$

146. The maxwell's equation $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ is obtained from

- A. Ampere's Law
- B. Faraday's Law
- C. Lenz's Law
- D. Both B and C

Ans. D

Sol. Faraday discovered that the induced emf, V_{emf} (in volts) in every closed circuit is equal to the time rate of change of the magnetic flux linkage by the circuit

$$V_{emf} = -\frac{d\lambda}{dt} = -N \frac{d\psi}{dt}$$

The negative sign shows that the induced voltage acts in such a way to oppose the flux producing it as given by Lenz's law.

$$\therefore V_{emf} = -\frac{\partial \psi}{\partial t}$$

$$V_{emf} = \oint_L \vec{E} \cdot d\vec{l} = -\frac{\partial}{\partial t} \int_S \vec{B} \cdot d\vec{t}$$

$$\therefore \boxed{\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}}$$

147. There are no transients in pure resistance circuits because they

- A. offer high resistance
- B. obey ohm's law
- C. does not store any energy
- D. are linear circuits

Ans. C

Sol. When the network is having only resistive elements no transients are present in the network since.

- (i) Resistor allows sudden change of current and voltage.
- (ii) Resistor does not store any energy.

Transients are present when a circuit is having any energy storage element.

148. Electrical fault between two windings of same phase of a generator having double star winding can be detected by the following protection in a generator:

- A. Short circuit protection
- B. Earth fault protection
- C. Inter turn Fault protection
- D. Over voltage protection

Ans. C

Sol. Inter turn stator winding fault can easily be detected by stator differential protection or stator earth fault protection. Hence, it is not very essential to provide special protection scheme for inter turn faults occurred in stator winding. This type of faults is generated if the insulation between conductor (with distinct potentials) in the same slot is punctured. This type of fault rapidly changes to earth fault.

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149. The zero sequence component of the unbalanced system of vector V_A, V_B and V_C is _____ of their vector sum.

- A. one - third
- B. one - fourth
- C. half
- D. two - third

Ans. A

Sol. zero sequence component is given as -

$$V_{A0} = \frac{1}{3}(V_a + V_b + V_c)$$

$$V_{B0} = \frac{1}{3}(V_a + V_b + V_c)$$

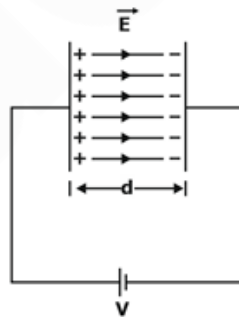
$$V_{C0} = \frac{1}{3}(V_a + V_b + V_c)$$

150. A capacitor of 10 pF is connected to a voltage source of 100 V. IF the distance between the capacitor plate is reduce to 50%, while it remains connected to the 100 V supply, the value of potential gradient in the second case will be

- A. Half of earlier value
- B. Same as earlier value
- C. Twice of earlier value
- D. One-fourth of earlier value

Ans. C

Sol.



$$\text{Potential gradient} = E_1 = \frac{V}{d}$$

If, V is kept constate and d is reduced to $\frac{d}{2}$, then

Potential gradient will be come

$$E_2 = \frac{V}{d/2} = 2\left(\frac{V}{d}\right) = 2E_1$$

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151. An ammeter has a current range of 0–5 A, and its internal resistance is 0.2Ω . In order to change the range to 0–25 A, what should be the value of resistance added and how it would connect with meter (i.e. series/parallel)?

- A. (0.05Ω /series)
- B. (0.05Ω /parallel)
- C. (0.20Ω /parallel)
- D. (0.20Ω /series)

Ans. B

Sol. By current divider rule, Amount of current flowing through a resistor is inversely proportional to the value of resistance.

Hence for more current to flow the shunt resistance should be of smaller value. Shunt resistance is connected in parallel to reduce the overall resistance of Ammeter.

152. A 50 KVA transformer has a core loss of 500 W and full load core loss of 900 W. The load KVA at which the efficiency is maximum

- A. 27.45 KVA
- B. 37.75 KVA
- C. 45.5 KVA
- D. 47.5 KVA

Ans. B

Sol.
$$x = \sqrt{\frac{P_i}{P_{cu}}} = \sqrt{\frac{500}{900}} = 0.7453$$

∴ the load at which efficiency is maximum.

$$= 0.7453 \times 50 = 37.27 \text{ KVA}$$

153. The power input to the 3 – Φ induction motor is 50 kW and the corresponding stator losses are 1 kW. The total mechanical power developed, when slip is 4% is;

- A. 26.56 kW
- B. 36.56 kW
- C. 47.04 kW
- D. 44.02 kW

Ans. C

Sol. Power input to the motor = 50 kW

Stator losses = 1 kW

So air-gap power $P_g = 50 - 1 = 49 \text{ kW}$

Since mechanical power developed $P_d = (1 - s) P_g$

Slip, $s = 0.04$

$$P_d = (1 - 0.04) \times 49$$

$$P_d = 47.04 \text{ kW}$$

154. Which of the following statements is valid for transformers?

- A. In an open circuit test, copper losses are obtained while in short circuit test, core losses are obtained.
- B. In an open circuit test, current is drawn at high power factor.
- C. In a short circuit test, current is drawn at zero power factor.
- D. In an open circuit test, current is drawn at low power factor.

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Ans. D

Sol. The power factor under no load condition is ≈ 0.2 (since more no load angle ϕ_0 ($70 - 75^\circ$) due to more magnetising current then power factor $\cos \phi \approx 0.2$) The power factor under S.C Test ≈ 0.5 to 0.6

155. For a series RLC circuit energized with a sinusoidal voltage source of frequency 4 rad/s , the applied voltage lags the current by an angle of $\tan^{-1} 2$ degrees. Then the value of R for $L = 1 \text{ H}$ and $C = 0.05 \text{ F}$ is

- A. 4.0 ohm
- B. 2.0 ohm
- C. 1.0 ohm
- D. 0.5 ohm

Ans. D

Sol. $Z = R + j(X_L - X_C)$

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

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

$$\theta = \tan^{-1} \left(\frac{4 - 5}{R} \right)$$

So, voltage lags the current by $\tan^{-1} (1/R)$

$$\text{So, } \frac{1}{R} = 2 = 0.5 \Omega$$

156. In a transformer maximum efficiency occurs at 80% of a full load then what is the Relation between iron loss at rated voltage (P_i) and copper loss full load.

- A. $25P_i = 16P_c$
- B. $20P_i = 16P_c$
- C. $18P_i = 7P_c$
- D. $21P_i = 20P_c$

Ans. A

Sol. At maximum efficiency

$$P_c = P_i$$

$$\text{Copper loss at } 70\% \text{ of full load} = (0.8)^2 P_c$$

$$\text{Iron loss at rated voltage} = P_i$$

$$P_i = (0.8)^2 P_c$$

$$P_i = \frac{16}{25} P_c$$

$$25 P_i = 16 P_c$$

157. The cost of transmission line conductor at 132 kV is Rs. 100 per metre. When transmission voltage is increased to 220 kV, the cost of conductor is
- A. Rs. 36/m B. Rs. 55/m
C. Rs. 26/m D. Rs. 80/m

Ans. A

Sol. Cost of conductor, $C \propto \frac{1}{V^2}$ for same p.f.

For the first case, $C_1 \propto \frac{1}{(132)^2}$;

For second case, $C_2 \propto \frac{1}{(220)^2}$

$$\therefore \frac{C_2}{C_1} = \left(\frac{132}{220}\right)^2 \text{ or } C_2 = 100 \times \left(\frac{132}{220}\right)^2 = \text{Rs. } 36/m$$

158. The impedance of a series RLC circuit is

- A. $\sqrt{R^2 + X_L^2 + X_C^2}$ B. $\sqrt{R^2 + X_L^2 - X_C^2}$
C. $\sqrt{R^2 + (X_L + X_C)^2}$ D. $\sqrt{R^2 + (X_L - X_C)^2}$

Ans. D

Sol.

For series resonant condition

$$Z=R$$

$$\omega = \frac{1}{\sqrt{LC}}$$

$$X_c = X_L$$

$$\text{phase} = \phi = 0$$

$$X_c = \frac{1}{\omega C}$$

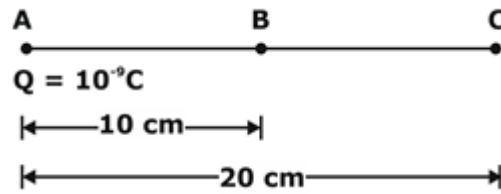
$$X_L = \omega L$$

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

159. A point charge of 10^{-9} C is placed at a point A in the free space. The potential difference between the two points 20 cm and 10 cm away from the charge at A will be
- A. 40 V B. 45 V
C. 50 V D. 55 V

Ans. B

Sol.



$$\begin{aligned} V_{BC} &= V_{BA} = -V_{CA} \\ &= \frac{Q}{4\pi\epsilon_0(AB)} - \frac{Q}{4\pi\epsilon_0(AC)} \\ &= \frac{Q}{4\pi\epsilon_0} \left(\frac{1}{AB} - \frac{1}{BC} \right) \\ &= 10^{-9} \times 9 \times 10^9 \left(\frac{1}{10} - \frac{1}{20} \right) \times \frac{1}{10^{-2}} \\ &= 45 \text{ V} \end{aligned}$$

160. Negative sequence relay is used commonly to protect
- A. An alternator
 - B. A transformer
 - C. A transmission line
 - D. A bus bar

Ans. A

Sol. Negative sequence currents gives rise to another rotating magnetic field in the generator in opposite direction which leads to excessive copper loss and pulsation in electromagnetic torque, which causes mechanical stress on the shaft of the alternator. So negative sequence relay is commonly used to protect alternator.

161. The making capacity of a circuit breaker is equal to:
- A. double the symmetrical breaking current
 - B. 2.55 times the symmetrical breaking current
 - C. 1.5 times the symmetrical breaking current
 - D. the symmetrical breaking current

Ans. B

Sol. Making capacity of a circuit breaker is the maximum current which the breaker can conduct at the instant of closing. The making capacity is considered to the peak value of the first cycle when there is an imaginary short circuit between the phases. Making capacity = 2.55× symmetrical breaking capacity.

162. The direction of rotation of a shaded pole motor is
- A. From north pole to south pole
 - B. From south pole to north pole
 - C. From unshaded part to shaded part
 - D. From shaded part to unshaded part

Ans. C

Sol. The net flux in the shaded portion of the pole lags the flux in the unshaded portion of the pole resulting in a net torque which causes the rotor to rotate from the unshaded to the shaded portion of the pole.

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163. Which of the following plants have the lowest operational and maintenance costs?

- A. Nuclear power plant
- B. Hydroelectric plant
- C. Thermal power plant
- D. Diesel power plant

Ans. B

Sol. Hydroelectric plants have lower operating and maintenance cost. The simple thumb rule is if you have fewer moving equipment then the operating and maintenance cost reduces. Another factor in operations is fuel cost which is practically free for hydro stations. To get an idea about the number of equipment's, a typical coal fired plant has a coal handling unit, a DM water unit, a generating unit, a cooling water unit and a ash handling unit while a hydro plant has a generating unit only.

164. If we want to step down 160 V to 20 V, what should be the turn ratio?

- A. 8
- B. 0.125
- C. 1.25
- D. None of these

Ans. A

Sol. $V_1 = 160 \text{ V}$, $V_2 = 20 \text{ V}$

$$\Rightarrow \frac{V_2}{V_1} = \frac{N_2}{N_1}$$
$$\Rightarrow \frac{20}{160} = \frac{N_2}{N_1}$$

Turns ratio is

$$n = N_1 / N_2 = 8:1$$

165. Which of the following is protected by Buchholz relay?

- A. Generator
- B. Synchronous machine
- C. DC machine
- D. Transformer

Ans. D

Sol. **Buchholz relay in transformer** is an oil container housed the connecting pipe from main tank to conservator tank. It has mainly two elements. The upper element consists of a float. The lower element consists of a baffle plate and mercury switch.

166. In a p-n diode, with the increase reverse bias such that it will not cross the break down voltage, the reverse current

- A. increase
- B. decrease
- C. remain constant
- D. uncertain

Ans. C

Sol. P-N diode the reverse saturation current is dependant only on temperature. So, any change in reverse bias will not cause any effect on the reverse current. However, if the reverse bias voltage is extremely high, then reverse current can suddenly increase and reach the break down voltage.

167. The mean free path for electron drift increases with
- A. Purity
 - B. Strain Hardening
 - C. Elastic modules
 - D. None of the above

Ans. A

Sol. Generally, mean free path is the average distance travelled by a certain moving particle in between consecutive collision with other particle or atom. Now, see the options. We have first option as purity. Purity comes in picture when we add less number of ions to a certain material, and impurity is just the reverse of it. So, it means purity=number of ions less. Now, mean free path is inversely proportional to the number of ions, which further means mean free path increases if ion is less, and ion is less in case of purity. So, option (A) is the answer.

168. The size of a welding machine is determined by
- A. Open circuit voltage
 - B. Closed circuit voltage
 - C. Output amperage
 - D. Input amperage

Ans. C

Sol. The size of a welding machine is determined by output amperage. So, option c is correct.

169. A single-phase ac voltage source has 200 V rms and a system connected consumes an active power of 300 W. What is the reactive power consumed by the system if 2.5 A rms current is drawn?
- A. 100 VAR
 - B. 200 VAR
 - C. 300 VAR
 - D. 400 VAR

Ans. D

Sol. $200 \times 2.5 \times \cos\phi = 300$

$$\cos \phi = \frac{300}{200 \times 2.5} = 0.6$$

$$\sin \phi = 0.8$$

Reactive power

$$= 200 \times 2.5 \times \sin\phi$$

$$= 200 \times 2.5 \times 0.8 = 400 \text{ VAR}$$

170. An energy meter supplied a power of 6.42 kwh, if the disc of the meter makes 1926 revolution then calculate the meter constant?
- A. 250
 - B. 300
 - C. 320
 - D. 360

Ans. B

Sol. Meter constant of an energy meter $K = \frac{\text{Revolution}}{\text{kwh}}$

$$K = \frac{1926}{6.42} = 300$$

171. A low frequency supply is given to the single phase AC system for track electrification because

- A. It improves commutation
- B. Increases efficiency
- C. Improves power factor
- D. All of these

Ans. D

Sol. A low frequency supply is given to the single phase AC system for track electrification because it improves power factor and commutation. It also increases efficiency.

172. Which of the following is true with a regenerative braking?

- A. It uses an energy recovery mechanism which slows down a vehicle by converting its kinetic energy into another form
- B. It uses an energy recovery mechanism which transforms the braking energy into kinetic energy of the vehicle
- C. It uses an energy recovery mechanism which reduces the speed of a vehicle by converting the electrical energy into kinetic energy.
- D. It regenerates the brake fluids for use at a future period

Ans. A

Sol. Regenerative braking is an energy recovery mechanism which slows a vehicle or object by converting its kinetic energy into a form which can be either used immediately or stored until needed. In this mechanism, the electric motor uses the vehicle's momentum to recover energy that would be otherwise lost to the brake discs as heat.

173. If the voltage across an element in a circuit is linearly proportional to the current through it, then it is a

- A. Capacitor
- B. Transformer
- C. Resistor
- D. Inductor

Ans. C

Sol. $V \propto I$ from Ohm's law

$$V = RI$$

R is resistor

174. The donor atoms in an n-type semiconductor at normal temperature

- A. Are neutral
- B. Carry a negative charge
- C. Carry a positive charge
- D. None of the above

Ans. A

Sol. The donor atoms in an n-type semiconductor at normal temperature are neutral.

175. Which of the following instrument can be used for to measure A.C. as well as D.C. ?

- (i) Electrodynamometer
 - (ii) PMMC
 - (iii) Thermocouple
 - (iv) Induction
- A. (i) and (iv)
 - B. (i) and (ii)
 - C. (i) and (iii)
 - D. (ii) and (iii)

Ans. C

Sol. Electrodynamometer can be used for A.C. as well as D.c. measurement.

PMMC can only be used for D.C. measurement. Thermocouple is also used for A.C. as well as D.C. measurement. Induction type instrument can only be used to measure A.C.

176. The lighting system of almost all the earlier coaches and all the newly manufactured coaches has

- A. 50 V
- B. 110 V
- C. 220 V
- D. 440 V

Ans. B

Sol. The lighting system of almost all the earlier coaches and all the newly manufactured coaches has 110V.

177. The phenomenon where there is an increase in voltage occurring at the receiving end of a long transmission line, above the voltage at the sending end is called _____

- A. Ferranti effect
- B. Litz effect
- C. Faraday phenomenon
- D. Maxwell effect

Ans. A

Sol. The Ferranti effect is an increase in voltage occurring at the receiving end of a long transmission line, above the voltage at the sending end. This occurs when the line is energized, but there is a very light load or the load is disconnected. The Ferranti Effect will be more pronounced the longer the line and the higher the voltage applied. The relative voltage rise is proportional to the square of the line length and the square of frequency.

178. The resistance R of a conductor is expressed as

Where :

E = Electric field intensity

A = Cross sectional area

J = Current density

l = Length of conductor

- A. $\frac{EA}{Jl}$
- B. $\frac{EJ}{Al}$
- C. $\frac{El}{JA}$
- D. $\frac{JA}{El}$

Ans. C

Sol. Where :

E = Electric field intensity

A = Cross sectional area

J = Current density

l = Length of conductor

$$\text{Resistance, } R = \frac{\rho l}{a}$$

ρ – Resistivity

l – length in the direction current flow

a – Cross sectional area through which current is passing conductivity,

$$\sigma = \frac{1}{\rho} = \frac{J}{E}$$

$$\Rightarrow R = \frac{E \cdot l}{J \cdot a}$$

179. A generated station has maximum demand of 30 MW, A load factor of 60% and plant capacity factor of 50%. The reserve capacity of the plant is

- A. 5 MW
- B. 4 MW
- C. 6 MW
- D. 100 MW

Ans. C

Sol. Plant capacity factor = $\frac{\text{Peakload}}{\text{Plant capacity}} \times \text{load factor}$

$$0.5 = \frac{30}{\text{Plant capacity}} \times 0.6$$

$$\therefore \text{Plant capacity} = 36 \text{ MW}$$

$$\begin{aligned} \therefore \text{Reserve capacity} &= \text{Plant capacity} - \text{Peak load} \\ &= 36 - 30 = 6 \text{ MW} \end{aligned}$$

180. Generally, Crawling in squirrel cage induction motors is tendency to run stably at speeds as low

- A. One-third of their synchronous speed
- B. One-fifth of their synchronous speed
- C. One-seventh of their synchronous speed
- D. One-ninth of their synchronous speed

Ans. C

Sol. In the squirrel cage type induction motor. It has a tendency to run at very low speed compared to its synchronous speed, this phenomena is known as crawling.

The resultant speed is nearly 1/7th of its synchronous speed.

The crawling in induction motor is occur due to the fact that harmonic fluxes produced in the gap of the stator winding of odd harmonic like 3rd, 5th and 7th etc. These harmonic create additional torque field in addition to synchronous torque.

181. Two machines which are operated in parallel, the inertia constant and rating of two machines are respectively-

$$H_1 = 4 \text{ MJ/MVA} ; S_1 = 400 \text{ MVA}$$

$$H_2 = 6 \text{ MJ/MVA} ; S_2 = 550 \text{ MVA}$$

Then calculate the total kinetic energy of two machine?

- A. 4200 MJ
- B. 4400 MJ
- C. 4700 MJ
- D. 4900 MJ

Ans. D

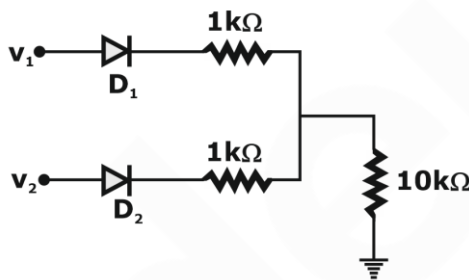
Sol. Total kinetic energy of two machine will be = $S_1H_1 + S_2H_2$

$$= 400 \times 4 + 550 \times 6$$

$$= 1600 + 3300$$

$$= 4900 \text{ MJ}$$

182. In figure $v_1 = 8 \text{ V}$ and $v_2 = 4 \text{ V}$. Which diode will conduct?



- A. D2 only
- B. D1 only
- C. Both D1 and D2
- D. Neither D1 nor D2

Ans. B

Sol. When 8 V is applied to the diode D1, it is forward-biased and starts conducting. The output voltage will be nearly 6-7 V. A 4 V voltage is applied at the anode of diode D2, but due to a greater voltage at its cathode, the diode D2 is reverse-biased, and will not conduct. Thus, only diode D1 will conduct.

183. **Statement I:** Inductor does not allow the sudden change in current.

Statement II: In case of sudden change in current voltage across inductor goes to infinite value.

- A. Both statement (I) and (II) are individually true and statement (II) is the correct explanation of statement (I).
- B. Both statement (I) and (II) are individually true but statement (II) is not the correct explanation of statement (I).
- C. Statement (I) is True but statement (II) is False.
- D. statement (I) is False but statement (III) is True.

Ans. A

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Sol. Voltage across inductor

$$V = L \frac{di}{dt}$$

$$dt \rightarrow 0$$

$$V \rightarrow \infty$$

184. Why are shunt reactors connected at the receiving end of long transmission line system:

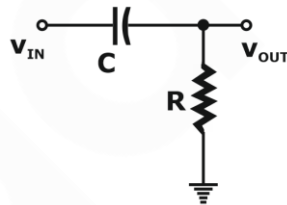
- A. To increase the terminal voltage
- B. To compensate voltage rise caused by capacitive charging at light load
- C. To improve power factor
- D. None of these

Ans. B

Sol. Voltage rise is the effect of capacitance of the charged transmission line dominating the inductive effect (because of very low current and so low flux) and with long lines interpreted as a series of parallel connected capacitors, a high value for effective capacitance or the high charging effect can be interpreted as resulting in a high voltage at the transmission line end.

A shunt reactor is an absorber of reactive power, thus increasing the energy efficiency of the system. It is the most compact device commonly used for reactive power compensation in long high-voltage transmission lines and in cable systems

185. In the electric circuit, if input voltage V_{IN} is a constant DC, then:



- i. Resistor R will bypass the capacitor C
 - ii. Capacitor C will be charged
 - iii. Capacitor will be discharged
- A. both i and ii B. both ii and iii
C. only iii D. only i

Ans. A

Sol. In the circuit, when V_{IN} is fixed, capacitor C will charge through resistor R and there will be no charging current, so there will be no output voltage V_{OUT} .

186. The dynamic resistance of diode varies as

- A. $1/I^2$
- B. $1/I$
- C. I
- D. I^2

Ans. B

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Sol. Here, we have to check the dynamic resistance's relation with I. The only way to find this is by examining the formula for dynamic resistance. Dynamic resistance of a diode is given by the formula: $D = \eta V_T / I$ ($I \Rightarrow$ Forward current) \Rightarrow So, from the formula we can say that D is inversely proportional to I.

187. As the load factor of a power plant increases, the cost per kWh of energy generated
- A. increases
 - B. decreases
 - C. may increase or decrease
 - D. remains the same

Ans. B

Sol. Higher load factor means lesser maximum demand. The station capacity is so selected that it must meet the maximum demand. Lower maximum demand means lower capacity of the plant which reduces the cost of plant.

188. Photodiodes operate at
- A. Forward bias
 - B. Breakdown region
 - C. Reverse bias
 - D. Saturation region

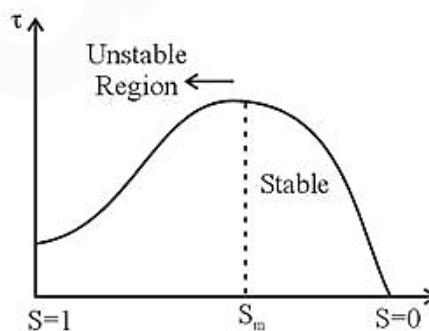
Ans. C

Sol. Photo diode \Rightarrow Conversion of light energy to electrical energy. A photo diode converts light to electricity more efficiently in the reverse biasing condition. The reason behind this is the extended depletion region as compared to other pn junction diodes. Also, it has a lower doping level.

189. The torque developed by any 3-phase induction motor at 0.8 p.u. slip is
- A. Full-load torque
 - B. unstable torque
 - C. starting torque
 - D. break down

Ans. B

Sol.



In the region in between the slip lies from $S = 1$ to $S = S_{mt}$, the motor comes under the pull-out torque region or breakdown region. In this region the induction motor become unstable, where the slip is nearly equal to 1.

190. Dissipation factor ($\tan \delta$) of a capacitance is measured by which bridge
- A. Anderson Bridge
 - B. Hay Bridge
 - C. Schering Bridge
 - D. Wilms Bridge

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Ans. C

Sol. Schering Bridge is used to measure the dissipation factor ($\tan \delta$) of a capacitance.

191. Feedback factor at the frequency of oscillation of a Wien bridge oscillator is:

- A. 3
- B. 1/3
- C. 1/29
- D. 3/29

Ans. B

Sol. For wein bridge oscillator, $f_o = 1/2\pi RC$. FOR sustained oscillations, $|A| \geq 3$.

At $w = w_o \Rightarrow$ Loop gain = $A/(3+j0) \Rightarrow A/3$.

192. What is the phase difference when two sinusoidal quantities are in phase quadrature?

- A. 180°
- B. 90°
- C. 60°
- D. 45°

Ans. B

Sol. Two sinusoidal quantities are said to be phase quadrature, when their phase difference is 90°.

193. For a salient pole synchronous machine, when the speed becomes super synchronous during hunting. The damper bars develops

- A. synchronous motor torque
- B. dc motor torque
- C. induction motor torque
- D. induction generator torque

Ans. D

Sol. During hunting the speed of synchronous machine varies between above and below the synchronous speed.

When the speed is super synchronous speed damper bar develops the induction generator torque and when the speed is sub synchronous speed it develop induction motor torque.

194. A single-phase 100 kVA, 1000 V/100 V, 50 Hz transformer has a voltage drop of 5% across its series impedance at full load. Of this, 3% is due to the resistance. The percentage regulation of the transformer at full load with 0.8 lagging power factor is

- A. 4.8
- B. 6.8
- C. 8.8
- D. 10.8

Ans. A

Sol. Impedance = 5% = 0.05 pu

Resistance = 3% = 0.03 pu

$$\text{Reactance} = \sqrt{(0.05)^2 - (0.03)^2} = 0.04 \text{ pu}$$

Voltage Regulation (0.8 pf lag) = $R \cos \phi + x \sin \phi$

$$= 0.03 \times 0.8 + 0.04 \times 0.6$$

$$= 0.048 \text{ pu}$$

$$\text{V.R} = 4.8\%$$

195. The armature in an electrical machine is _____
- A. Always a stator
 - B. Always a rotor
 - C. Either a stator or rotor
 - D. Always a stator in a motor and rotor in a generator

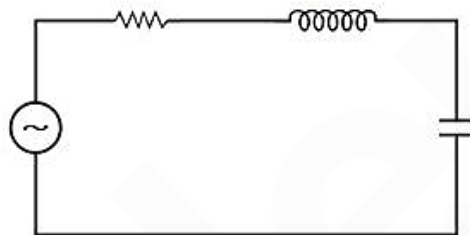
Ans. C

Sol. In dc machine, armature is a rotor and for synchronous machine armature is a stator. Therefore armature in an electrical machine is either a stator or rotor.

196. A network is said to be under resonance when the voltage and the current at the network input terminals are
- A. in phase
 - B. out of phase
 - C. in phase quadrature
 - D. in phase, and have equal magnitudes

Ans. A

Sol.



$$Z = R + j\omega L - \frac{j}{\omega C}$$

$$R + j\left(\omega L - \frac{1}{\omega C}\right)$$

$$\text{At resonance} \rightarrow \omega L - \frac{1}{\omega C} = 0 \Rightarrow \omega_r = \frac{1}{\sqrt{LC}}$$

At Resonating frequency ω_r , the impedance in RLC series circuit would be minimum and It will be equal to R and the current would be maximum. Which means that at Resonance circuit is purely Resistive so the voltage and current at resonance condition are in phase.

197. Which instruments can be used for DC measurement only?
- A. Moving coil
 - B. Attraction-type moving iron
 - C. Moving iron
 - D. Repulsion-type moving iron

Ans. A

Sol. The permanent magnet moving coil instrument or PMMC type instrument uses two permanent magnets in order to create stationary magnetic field. These types of instruments are only used for measuring the DC quantities as if we apply AC current to this type of instruments the direction of current will be reversed during negative half cycle and hence the direction of torque will also be reversed which gives average value of torque zero. The pointer will not deflect due to high frequency from its mean position showing zero reading. However, it can measure the direct current very accurately.

198. In some substances when an electric field is applied the substance becomes polarized. The electrons and nuclei assume new geometrical positions and the mechanical dimensions are altered. This phenomenon is called:

- A. Electrostriction
- B. Hall-Effect
- C. Polarization
- D. Magnetization

Ans. A

Sol. **Electrostriction:** It is a property of a material that causes change in the dimension with application of electric field and hence, the position of electrons and nuclei is also changed.

Hall-Effect: It states that if a specimen (metal or semiconductor) carrying the current is placed in a transverse magnetic field, an electrical field is induced.

Polarization: It is technique, due to which the positive charges in a material gets separated from the negative charges.

Magnetization: It is related to magnetic polarization

199. In two wattmeter method to measure the power what would be the reading of two wattmeter individually at power factor $\cos\phi = 0.5$?

- A. $P_1 = 0 ; P_2 = \frac{VI}{2}$
- B. $P_1 = \frac{3}{2}VI ; P_2 = 0$
- C. $P_1 = \frac{\sqrt{3}}{2}VI ; P_2 = -\frac{\sqrt{3}}{2}VI$
- D. $P_1 = P_2 = \frac{3}{2}VI$

Ans. B

Sol. In two wattmeter method the individual ready of wattmeter-

$$P_1 = \sqrt{3} VI \cos(30 - \phi)$$

And $P_2 = \sqrt{3} VI \cos(30 + \phi)$

When P.f. = 0.5 = $\cos\phi$ i.e., $\phi = 60^\circ$

$$\text{So } P_1 = \sqrt{3} VI \cos(30 - 60^\circ) = \frac{3}{2}VI$$

$$P_2 = \sqrt{3} VI \cos(30 + 60^\circ) = 0$$

200. Find the percentage load factor when peak demand is 436 kW, total energy use is 57200 kWh and the number of days in billing cycle is 30 days.

- A. 20.36%
- B. 15.60%
- C. 18.22%
- D. 25.75%

Ans. C

$$\text{Sol. Load factor} = \frac{\text{Average Load}}{\text{Maximum load in the given time period}}$$

$$\text{Load factor \%} = \frac{57200}{30 \times 24 \times 436} \times 100 = 18.22\%$$

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