MEGA MOCK CHALLENGE

gradeup

NLC GET 2020

Mechanical Engineering

Mega Mock Challenge

(Apr. 18- Apr. 19 2020)

Questions & Solutions

1. The HCF of two numbers is 15 and their LCM is 225. If one of the numbers is 75, then the other is:

   A. 105 B. 90

   C. 60 D. 45

Ans. D

Sol. First number × Second number = HCF × LCM

75 ×Second number = 15 × 225

∴ Second number = $\frac{15\times225}{75} = 45$

2. The sum and product of two numbers are 12 and 35 respectively. The sum of their reciprocals will be how much?

   A. 1/3 B. 1/5

   C. 12/35 D. 35/12

Ans. C

Sol. Let the two numbers be x and y

So, according to the question

x+y =12 .....(i)

xy = 35 .....(ii)

on dividing (i) by (ii), we get

$$\frac{x+y}{xy} = \frac{1}{y} + \frac{1}{x} = \frac{12}{35}$$

3. A and B can do a piece of work in 72 days. B and C can do it in 120 days and A and C can do it in 90 days. A alone can do it in:

   A. 120 days B. 130 days

   C. 150 days D. 100 days

Ans. A

Sol.

	Days	LCM	efficiency
(A + B)	72		5
(B + C)	120	360	3
(A + C)	90		4

By adding all

2(A + B + C) = 5 + 3 + 4 = 12

⇒(A + B + C) = 6

Efficiency of C = 6 – 5 = 1

Efficiency of A = 6 - 3 = 3

Efficiency of B = 6 - 4 = 2

Thus, Number of days required to complete the work by A alone = 360/3

= 120 days

4. A vendor sells lemons at the rate of 5 for ₹ 14, gaining thereby 40%. For how much did he buy a dozen lemons ?

A. ₹ 20 B. ₹ 21

C. ₹ 24 D. ₹ 28

Ans. C

Sol. C.P. of 5 lemons

$= \frac{100}{140} \times 14 = \text{Rs. } 10$

∴ C.P. of 12 lemons

10*12/5 =24

5. Find the square root of 2401?

A. 49 B. 41

C. 51 D. 71

Ans. A

Sol. 2401 = 7 x 7 x 7 x 7

$\sqrt{2401} = \sqrt{7 \times 7 \times 7 \times 7}$ = 7 x 7 = 49

6. When a number is increased by 120, it becomes 130% of itself. What is the number?

A. 400 B. 520

C. 460 D. 580

Ans. A

Sol. Let the number be x

Then x+120=130%of x

$X+120=\frac{130}{100} \times x$

120=1.3x-x

0.3x=120

X=400

7. If 25 is added to a number it becomes 3 less than thrice of the number. Then number is:

A. 15 B. 14

C. 19 D. 20

Ans. B

Sol. Let the number be x,

According to the question,

$x + 25 = 3x - 3$

$\Rightarrow 3x - x = 25 + 3$

$\Rightarrow 2x = 28$

$\Rightarrow x = 14$

8. If $2^x = \sqrt[3]{32}$, find x ?

A. 5 B. 3

C. 5/3 D. 4/5

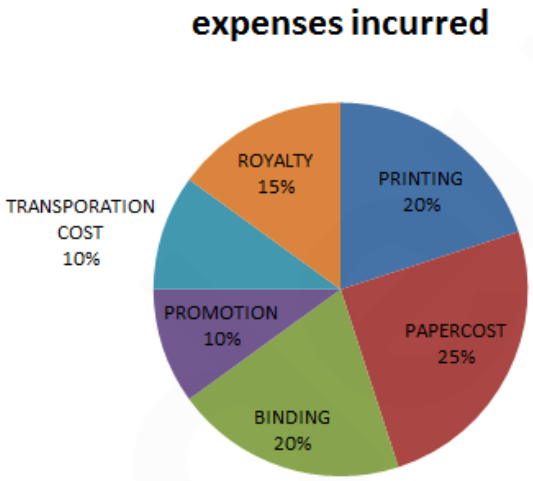
Ans. C

Sol. $2^x = 32^{1/3}$

$2^x = 2^{5/3}$

$x = \frac{5}{3}$

9. The following pie chart shows the percentage distribution of the expenses incurred by a publishing house. Study the pie chart and answer the following questions:



Royalty is less than printing cost by how much percent?

A. 5% B. 33.33%

C. 20% D. 25%

Ans. D

Sol. Percent Difference = 20% - 15% = 5%

We have to find out the percent difference with respect to printing cost. Hence, required percentage = (5/20)*100% = 25%

10. For an edition of 12500 copies, the amount of royalty paid is Rs 281250 What should be the selling price of the book if profit expected is 5%?

A. 152.50 B. 157.50

C. 162.50 D. 167.50

Ans. B

Sol. SP=105% CP

15:105=281250:SP of 12500 books

SP of 12500 books = 1968750

SP of one book= = 1968750/12500=157.50

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

A. Kufri
B. Nainital
C. Dehradun
D. Ranikhet

Ans. A

Sol. All except 'Kufri', all others are in Uttarakhand while 'Kufri' is in Himachal Pradesh.
Hence, the correct option is A.

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

8 : 448

A. 10 : 900
B. 9 : 729
C. 15 : 3125
D. 6 :2160

Ans. A

Sol. The relation between the given number-pair is-

$$x : x^2 (x - 1)$$

So,

$$8 : 8^2 (8 - 1)$$
$$8 : 64 \times 7$$
$$8 : 448$$

Similarly,

$$10 : 10^2 (10 - 1)$$
$$10 : 100 \times 9$$
$$10 : 900$$

Hence, option A is correct.

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

7, 10, 15, 24, 41, 74, ?

A. 149
B. 169
C. 159
D. 139

Ans. D

Sol. Logic:

$2^1+5=7$

$2^2+6=10$

$2^3+7=15$

$2^4+8=24$

$2^5+9=41$

$2^6+10=74$

$2^7+11=139$

So, Missing Number=139

Hence, option D is the correct response.

14. A is not elder to D, A is elder to C, C is not elder to A, B is not elder to C. Who is the eldest?

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

Ans. A

Sol. A.T.Q,

D > A, A > C, B > C

On combining all we get the order as,

B < C < A < D

So, D is eldest among all.

Hence, the correct option is (A).

15. In a certain language, 'sdr ngt olp' means 'Going to Patna', 'olp swq' means 'Going there' and 'yyt swq jht' means 'There was Golghar'. What is the code for 'there' in that language?

A. olp
B. swq
C. yyt
D. ngt

Ans. B

Sol. 'sdr ngt olp' = 'Going to Patna'_____(1)

'olp swq' = 'Going there' _____(2)

'yyt swq jht' = 'There was Golghar'_____(3)

From 1 and 2, 'Going' = olp.

Therefore, 'there' = swq

Hence, option (B) is the correct response.

16. Arrange the following words in a meaningful order.

1) Word
2) Paragraph
3) Letter
4) Sentence
5) Essay

A. (3, 1, 2, 4, 5)
B. (3, 2, 4, 1, 5)
C. (3, 1, 4, 2, 5)
D. (3, 1, 4, 5, 2)

Ans. C

Sol. The correct meaningful sequence is –

3. Letter
1. Word
4. Sentence
2. Paragraph
5. Essay

A combination of letters make a word, words together form a sentence, using sentences we write a paragraph and an essay comprises of paragraphs.

So, the order is (3, 1, 4, 2, 5).

Hence, the correct option is C .

17. If 'M' means '×', 'K' means '÷', 'G' means '+', and 'P' means '–', then what is the value of 34 P 12 M 5 G 20 K 4 M 2 P 3

A. 62 B. -19

C. 29 D. 41

Ans. B

Sol.

Symbols	M	K	G	P
Codes	×	÷	+	–

34 P 12 M 5 G 20 K 4 M 2 P 3

⇒ 34 – 12 × 5 + 20 ÷ 4 × 2 – 3

⇒ 34 – (12 × 5)+ (20 ÷ 4) × 2 – 3

⇒ 34 – 60 + (5× 2) – 3

⇒ 34 – 60 + 10 – 3

⇒ 34-50-3

⇒ – 19

Hence, option B is the correct response.

18. **Direction:** Study the following data carefully and answer the questions accordingly. Eight people J, K, L, M, N, O, P, and Q are sitting around a rectangular table facing outside. Two people are sitting on each side of the table. P and M are not immediate neighbors. Four people are sitting between Q and O. Three people are sitting between M and K. J is not an immediate neighbor of K and M. Two people are sitting between O and M where O is not sitting on the same side with K. K sits third to the right of L and both are not opposite to each other.

Who sits to the immediate right of Q?

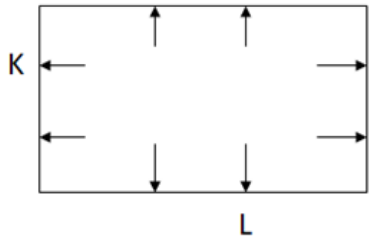
A. K B. L

C. P D. M

E. None of these

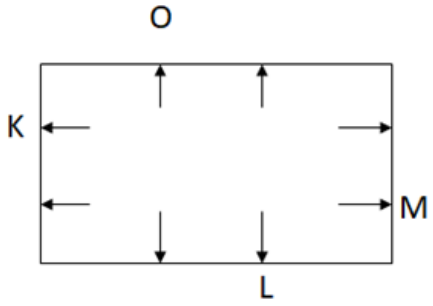
Ans. C

Sol. 1) K sits third to the right of L and both are not opposite to each other.



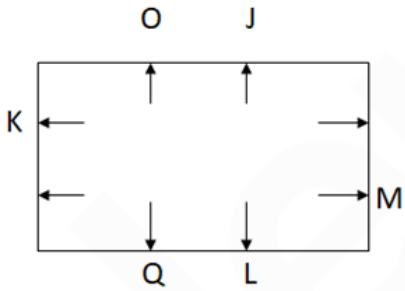
2) Three people are sitting between M and K.

3) Two people are sitting between O and M where O is not sitting on the same edge with K.

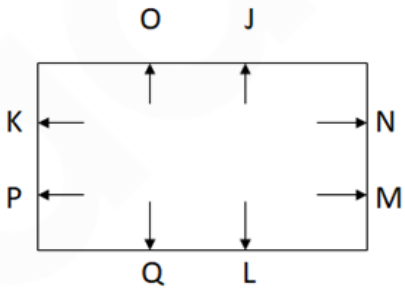


4) Four people are sitting between Q and O.

5) J is not an immediate neighbor of K and M.

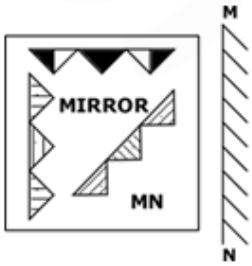


6) P and M are not immediate neighbors.



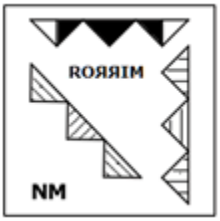
Therefore, option C is the correct answer.

19. Which of the following options will give the mirror image of the given figure when a mirror is placed along MN?



A. 

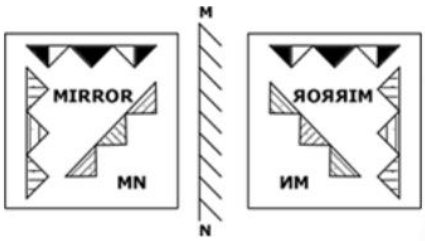
B. 

C. 

D. 

Ans. D

Sol. On observing the options we can see that the figure given under option (D) is the appropriate answer.

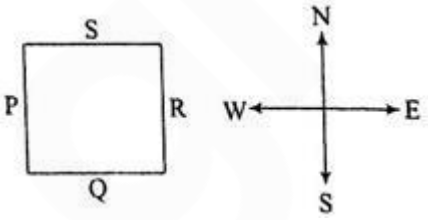


Hence, option D is correct.

20. P, Q, R and S are playing carrom. P and R are partners, S and Q are partners. S is sitting to the right of R who faces west, then Q faces which direction?

A. South
B. East
C. West
D. North

Ans. D

Sol. 

Q is facing North.

Hence, option D is correct.

21. Gandhiji was highly influenced by the book 'Unto the last'. Who was the author of this book?

A. Tolstoy
B. John Ruskin
C. Louis Fischer
D. Blavatsky

Ans. B

Sol. • **John Ruskin** was the author of the book '**Unto the Last'**.
• Some other **major works of Ruskin are**- Modern painters, The Seven Lamps of Architecture, Stones of Venice etc.
• Many founding fathers of Labour party in India were also influenced by this book.

22. Which ruler defeated the Marathas in the third battle of Panipat in 1761?
A. Ahmed Shah
B. Shah Alam II
C. Ahmad Shah Abdali
D. Muhammad Shah

Ans. C

Sol. * **Ahmad Shah Abdali**defeated the Marathas in the third battle of Panipat in 1761.
* In this battle, Marathas were led by Sadashiv Rao Bhau, while the Peshwa at that time was BalajiBajirao.

23. No Confidence Motion can be passed in .....?
A. Only Lok Sabha
B. Only Rajya Sabha
C. Both Rajya and Lok Sabha
D. Neither A and B

Ans. A

Sol. No Confidence Motion can be passed only in **Lok Sabha**.
• The no confidence motion needs **50 members** for support to be admitted in house.
• The motion is based on the fact under **Article 75** which says that the council of ministers shall be collectively responsible to the Lok Sabha.
• It is **not require to state reason** for putting No Confidence Motion.
• It can be moved against the whole council of ministers only.

24. Which among the following is the longest river of Peninsular India?
A. Narmada
B. Krishna
C. Godavari
D. Luni

Ans. C

Sol. • **Godavari is the longest river of Peninsular India** and 2nd longest river of India.
• This river is also known as Dakshin Ganga.
• It originates in Western Ghats of central India near Trimbak in Nashik District in Maharashtra.

25. Coimbatore is famous for which of the following industries?
A. Textile industry
B. Leather industry
C. Chemical industry
D. None of these

Ans. A

Sol. • **Coimbatore** is also known as **Kovai and Koyamuthur**.
• It is a major city in the Indian state of Tamil Nadu.
• This city is famous for textile industry.
• Coimbatore is called the "**Manchester of South India**" due to its extensive textile industry.

26. White blood cells are also known as _____.

A. Erythrocyte
B. Leukocytes
C. Thrombocytes
D. None of these

Ans. B

Sol. * **White blood cells are also known as Leukocytes**.
* They help from protecting against diseases.
* The normal white cell count is usually between 4×10^9/L and 1.1×10^{10}/L.
* Decrease in the White Blood cells is called Leukopenia.

27. 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.

28. World's largest cricket stadium is located in which of the following cities?

A. Melbourne
B. Sydney
C. London
D. Ahmedabad

Ans. D

Sol. • Sardar Patel Stadium, with seating capacity of 110,000, is the world's largest cricket stadium.
• The Sardar Vallabhbhai Patel Stadium is commonly known as Motera Stadium.
• It is located in Ahmedabad, Gujarat.
• It is the second largest stadium in the World.

29. Who wrote the book India – 'A wounded Civilization'?

A. Sushil Kumar
B. Satendra Kant
C. APJ Abdul Kalam
D. V.S. Naipaul

Ans. D

Sol. • **India: A Wounded Civilization (1977) is a book , written by V. S. Naipaul**.
• In 1971 he was awarded the **Booker Prize for In a Free State**.
• In 1990, V.S. Naipaul received a knighthood for services to literature.
• In 1993, He was the first recipient of the **David Cohen British Literature Prize**.
• He received the **Nobel Prize in Literature in 2001**.
• In this work he casts a more analytical eye than before over Indian attitudes, while recapitulating and further probing the feelings aroused in him by this vast, mysterious, and agonized country.

30. Junagarh caves are located in _____.

A. Rajasthan
B. Gujrat
C. MP
D. Maharashtra

Ans. B

Sol. * **Junagarh caves are situated in Junagarh district of Gujrat.**
* There are mainly Buddhist caves.
* The presence of "Upper Kot" is the unique feature of these caves.

31. In the sentence identify the segment which contains the grammatical error. If the sentence has no error, then select 'No error'.
These all mangoes are ripe.

A. These all
B. mangoes
C. are ripe
D. No error

Ans. A

Sol. Option A has the grammatically incorrect part. Here, it is an error related to position of words.
Hence, All these …….should be used here.

32. Identify the best way to improve the underlined part of the given sentence. If there is no improvement required, select 'no Improvement'.
Hold <u>hands of your child</u> while crossing the road.

A. your child's hands
B. your child's hand
C. hand of your child
D. No improvement

Ans. B

Sol. While crossing a road, a single hand is held not both hands. So, it is incorrect to say hold hands. Apart from this, the sentence should use apostrophe (') as it is used to denote ownership and make the sentence concise. The sentence must be written as "hold your child's hand while crossing the road". Hence, option B is the correct answer.

33. Select the most appropriate option to fill in the blank.
They drove _____ the Marina beach.

A. on
B. along
C. for
D. with

Ans. B

Sol. The correct preposition to be used in the given sentence is "**along**". The word **along** can be used as a preposition or an adverb. As a preposition "***along***" is used to talk about movement on or beside a line. When used as a preposition, it is followed by a noun. Hence, option B is the correct answer.
Example: We walked **along** the road.
When **along** is used as an adverb, it is not followed by a noun.
Example: She brought her children **along**.

34. Select the most appropriate synonym of the given word.
CURSORY
A. little
B. quick
C. eager
D. tender

Ans. B

Sol. CURSORY means done quickly with little attention to detail.
Eager means strongly wanting to do or have something.
Tender means showing gentleness, kindness, and affection.
Hence, option B is the correct answer.

35. Select the most appropriate antonym of the given word.
DEFUSE
A. control
B. understand
C. aggravate
D. decelerate

Ans. C

Sol. Defuse means to make less dangerous, tense or hostile.
Aggravate means to provoke or to irritate.
Decelerate means to lose velocity; move more slowly
Hence, option C is the correct answer.

36. Given below are four jumbled sentences. Pick the option that gives their correct order.
P: Shardul was waiting for his school bus.
Q: As a leader of the house, he wanted to win the General Championship by scoring maximum points.
R: It was 7 o' clock in the morning.
S: He was keenly looking at the approaching vehicles.
A. PRSQ
B. SRPQ
C. RSPQ
D. RPSQ

Ans. D

Sol. R is an introductory sentence as it starts with the time- 7 O' clock in the morning. Sentence P points out that he is waiting for his school bus. Sentence S focuses on how keenly he is looking at the vehicle approaching him. The only option with sequence RPS is **option D**. Hence, it is the answer.

37. Select the correctly spelt word.
A. exacerbate
B. exacarbate
C. exacerbate
D. exacarbat

Ans. A

Sol. Option A has the correctly spelt word. The word "exacerbate" means make a problem, bad situation or negative feeling worse. Hence, option A is the correct choice.

38. Select the word which means the same as the group of words given.
Practice of employing spies in war
A. Esplanade
B. Espionage
C. Espadrille
D. Estrangement

Ans. B

Sol. Estrangement = Separation resulting from hostility
Espadrille = A sandal with a sole made of rope or rubber and a cloth upper part
Espionage = The systematic use of spies to get military or political secrets

Esplanade = A long stretch of open level ground (paved or grassy) for walking beside the seashore
Hence, option B is the correct answer.

39. Choose the most appropriate option to change the voice (active/passive) form of the given sentence.
Have you been invited by Krishna?
A. Have you invited Krishna?
B. Has Krishna invited you?
C. Does Krishna have invited you?
D. Has Krishna invite you?

Ans. B

Sol. The given sentence is in passive voice. The structure for passive/active voices would be:
Passive: Has/have + Object + Verb (IIIrd form) + by + subject...?
Active: Has/have + subject + verb (IIIrd form) + object...?
So, the active voice of the given sentence would be:
Has Krishna invited you?
Hence, option B is the correct answer.

40. Select the most appropriate meaning of the idiom given in bold in the sentence.
There was a job for me **to cut my teeth on.**
A. to gain experience
B. to try
C. to sharpen my wits
D. to earn a decent salary

Ans. A

Sol. The idom "cut your teeth on something" means to do something that gives you your first experience of a particular type of work. Hence, option A is the correct answer.

41. The Nusselt number(Nu) in case of natural convection is depends on
A. Gr and Re
B. Pr and Re
C. Gr and Pr
D. Gr and Re

Ans. C

Sol. Functional relationship of Nusselt number for free convention/ natural convection is
$Nu = C(Gr.Pr)^m$
m = 1/4 for laminar flow and
m = 1/3 for turbulent flow

42. Two Pelton wheels P and Q are having same specific speed and working under the same head. Wheel P provides 1600 kW at 400 RPM. If wheel Q produces 100 kW, then its RPM will be

A. 6400 B. 4000

C. 1600 D. 400

Ans. C

Sol. Given same specific speed and working under the same head.

$N_1.P_1^{1/2}=N_2.P_2^{1/2}$

$400 \times (1600)^{1/2} = (100)^{1/2} \times N_2$

Therefore, $N_2=1600$ rpm

43. A steel plate of thermal conductivity 50 W/mK and thickness 10 cm passes a heat flux by conduction of 25 KW/m^2. If the temperature of hot surface of the plate is 100°C, then what is the temperature of cooler surface of the plate?

A. 30°C B. 40°C

C. 50°C D. None of these

Ans. C

Sol. Applying Fourier law of conduction

$$Q = KA\frac{dT}{dx}$$

$25 \times 10^{3} \times .1 = 50 \times (100 - T_{cooler})$

$T_{cooler} = 50\ °C$

44. A reversible heat engine is operating between a source at T1 and a sink at T2. What will be the effect on efficiency if T2 decreases?

A. decreases B. increases

C. remains constant D. none of the above

Ans. B

Sol. The efficiency of a reversible heat engine is operating between a source at T_1 and a sink at T_2 is given by,

η = Work done / Heat supplied

$\eta_{rev} = (T_1 - T_2)/T_1$

$\eta_{rev} = 1 - (T_1/T_2)$

From the above equation, as T_2 decreases the efficiency increases and tends towards 100%.

45. Determine the type of reaction written below.

Liquid + Solid1 → Solid2

A. Eutectic Reaction B. Eutectoid Reaction

C. Peritectic Reaction D. Peritectoid Reaction

Ans. C

Sol. Eutectic Reaction: Liquid → Solid1 + Solid2

Eutectoid Reaction: Solid1 → Solid2 + Solid3

Peritectic Reaction: Liquid + Solid1 → Solid2

Peritectoid Reaction: Solid1 + Solid2 → Solid3

46. While measuring the thread diameter using Three-wire method of an ISO- metric thread whose pitch is p = 3mm. What is the best wire size?

A. 1.73mm B. 2mm

C. 2.5mm D. 3mm

Ans. A

Sol. Given, p = 3mm

α = 60° (ISO-metric thread)

Best wire size, d = 0.5p/cos(α/2)

$$d = 0.5 \times 3 \times \frac{2}{\sqrt{3}} = 1.732 \text{ mm [Ans]}$$

47. Which of the following methods cannot be used for welding carbon steel?

A. Arc welding B. Gas welding

C. Ultrasonic welding D. Forge welding

Ans. C

Sol. For the welding of carbon steel material, one may use the arc welding method. To gas weld carbon steel is also a feasible option and carbon steels can be treated using forge welding also, but it cannot be welded using ultrasonic welding.

48. Which of these is an approximate straight line motion mechanism?

A. Scott Russell's mechanism B. Hart's mechanism

C. Peaucellier mechanism D. Watt's mechanism

Ans. D

Sol. Watt's consists of three links. Two of them are of equal length whereas one is shorter. Due to the rotation motion of the longer links, the centre of the shorter link traces an approximate straight line. Out of the following mechanism, Watt's mechanism is an approximate straight line mechanism whereas the rest are exact straight line mechanisms.

49. The value of reflectivity for gases and white bodies respectively are.

A. 1, 0 B. 0.5, 0.5

C. 0, 1 D. 1, 1

Ans. C

Sol. o Reflectivity is defined as the fraction of incident radiation that is reflected.

o Gases do not reflect radiation hence reflectivity is zero.

o White bodies reflect all radiation.

50. What is the form graphite structure in ductile cast iron?

A. Spheroidal
B. Nodular
C. Flakes
D. Layers

Ans. B

Sol. The graphite structure of a ductile cast iron is nodular form and it is seen as tiny nodules with graphite in layers forming the nodules.

51. What is the effect of regeneration on mean temperature of heat addition in Brayton cycle?

A. mean temperature of heat addition decreases because of regeneration
B. mean temperature of heat addition increases because of regeneration
C. mean temperature of heat addition is not affected by use of regenerator
D. none of the above

Ans. B

Sol. Due to Regeneration, heat addition process (inlet to combustion chamber)starts at a temperature higher than the earlier whereas the exit temperature of the combustion chamber remains constant so the mean temperature(average) of heat addition increases.

52. The specific heat at constant pressure for an ideal gas is given by $C_P=0.9+2.7 \times 10^{-4} T$ kJ/kg-k

Where T is in Kelvin. The change in enthalpy for this ideal gas undergoing a process in which the temperature changes from 27^0C to 127^0C is most nearly.

A. 90 kJ/kg
B. 108.9 kJ/kg
C. 99.45 kJ/kg
D. 105.2 kJ/kg

Ans. C

Sol. Given Sp. Heat=

$C_P=0.9+2.7 \times 10^{-4} T$ kJ/kg-k

Enthalpy for ideal gas is given by

$dh = M C_P dt$

$$\int dh = \int_{300}^{400} 0.9 + (2.7 \times 10^{-4})TdT$$

$$= 0.9T + (2.7 \times 10^{-4}) \frac{T^2}{2}\Big|_{300}^{400} = 99.45 \text{ kJ/kg}$$

53. A pipe is connected in series to another pipe whose diameter is twice and length is 32 times that of the first pipe. The ratio of frictional head losses for the first pipe to those for the second pipe is (both the pipes have the same frictional constant)

A. 8
B. 4
C. 2
D. 1

Ans. D

Sol. Friction coefficient is same for both the pipes

Frictional head is given by,

$$h_f = \frac{fLV^2}{D \times 2g} = \frac{fLQ^2}{2g\left(\frac{\pi}{4}\right)^2 D^5}$$

$$h_f \propto \frac{L}{D^5}$$

$$\frac{h_{f1}}{h_{f2}} = \frac{L_1}{L_2}\left(\frac{D_2}{D_1}\right)^5 = \frac{L_1}{32L_1}\left(\frac{2D_1}{D_1}\right)^5 = 1$$

54. What is the poison's ratio of a material that doesn't expand or contract in volume when stressed?

A. 0.25 B. 0.5

C. 0.30 D. 0.15

Ans. B

Sol. Since, there is no change in volume.

That means the material is incompressible and Poisson's ratio for an incompressible material is 0.5

55. Three metal walls of the same thickness and cross sectional area have thermal conductivities k, 2k and 3k respectively. The temperature drop across the walls (for same heat transfer) will be in the ratio

A. 3:1.5:1 B. 1:1:1

C. 1:2:3 D. Given data is insufficient

Ans. A

Sol. Given,

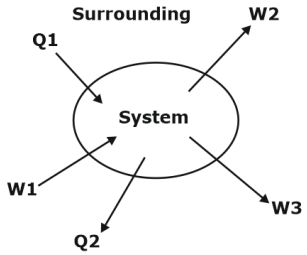
As, $\delta_1 = \delta_2 = \delta_3$ and cross sectional areas are same i.e. temperature drop varies inversely with thermal conductivity.

thus,

$$\Delta T_1 : \Delta T_2 : \Delta T_3 = \frac{1}{K} : \frac{1}{2K} : \frac{1}{3K}$$

$\Delta T_1 : \Delta T_2 : \Delta T_3 = 6 : 3 : 2 \Rightarrow 3 : 1.5 : 1$

56. Consider the below diagram of heat transfer and work transfer for a system. What will be the first law equation for the below system?



A. $(Q1 - Q2) = \Delta E - (W2 + W3 - W1)$ B. $(Q1 + Q2) = \Delta E + (W2 - W3 + W1)$

C. $(Q1 - Q2) = \Delta E + (W2 + W3 - W1)$ D. none of the above

Ans. C

Sol. If Q is the amount of heat transferred to the system and W is the amount of work transferred from the system during the process, then the net energy (Q – W) is stored in the system. This energy is neither heat nor work but it is called as internal energy(ΔE).

$Q - W = \Delta E$

Therefore,

$Q = \Delta E + W$

57. In Normalizing cooling is done in which of the following medium?

A. Air B. Water

C. Oil D. Furnace

Ans. A

Sol. Cooling rate is medium during normalizing and hence air cooling is done. It imparts hardness to iron and help in forming fine grain structure.

58. In Laminar flow which force is dominant

A. Viscous force B. Pressure force

C. Gravity force D. Inertia force

Ans. A

Sol. In Laminar flow viscous force is dominant.

Here due to high viscous force the fluid flow is in the form of lamina of layers

59. If the mean stress value for a sinusoidal stress function is zero, then this type of stress falls in which category?

A. Fluctuating Stresses B. Alternating Stresses

C. Repeated Stresses D. Reversed Stresses

Ans. D

Sol. If mean is to be zero, then there must be compressive as well as tensile stresses and hence belongs to reversed stresses category.

60. What is the dryness fraction (x) at saturated liquid point?

A. 0 B. 0.5

C. 1 D. Cannot be determined

Ans. A

Sol. Dryness fraction (X) is the ratio of mass of vapour to total mass of mixture, When we say mixture' it defines the mixture of liquid and vapour.

In Qualitative view, it is the %age amount of Vapour present in a mixture of (liq+vap).

So at saturated liquid point Dryness fraction (x)=0

61. The heat loss, without the presence of a fin is 3 W. If the efficiency and effectiveness is 0.5 and 4 respectively, what is the heat loss from the fin, keeping the entire surface at base temperature?

A. 6 W
B. 24 W
C. 12 W
D. 8 W

Ans. B

Sol. Given,

efficiency= 0.5

effectiveness = 4

Effectiveness =

$$\frac{Q_{with}}{Q_{w/0}}$$

$$4 = \frac{Q_{with}}{3}$$

$$Q_{with} = 12\ W$$

$$\eta = \frac{q_{act}}{q_{max}}$$

$$0.5 = \frac{12}{q_{max}}$$

$$q_{max} = 24\ W$$

62. Which one of these is autogenous welding?

A. TIG
B. MIG
C. Gas
D. Friction

Ans. D

Sol. o In an autogeneous welding process, no filler material is used.

o In Friction welding no filler material is used from outside, thus it is an example of autogenous welding.

63. The purpose of employing supercharging for an engine is

A. to provide forced cooling air

B. to raise exhaust pressure

C. to inject excess fuel for coping with higher load

D. to supply an intake of air at a density greater than the density of the surrounding atmosphere

Ans. D

Sol. Due to supercharging, greater mass flow-rate provided. Thus more oxygen to support combustion is available in combustion chamber. This allow more fuel to be burned and more work to be done per cycle, increasing the power output of the engine.

64. Rankine vortex motion is

A. Free vortex motion + forced vortex motion
B. Free vortex motion only
C. Forced vortex motion only
D. Rotational motion

Ans. A

Sol. Rankine vortex motion is free vortex motion (outside) + forced vortex (inside) motion. It is also known as Tornado.

65. The dynamic load capacity of ball bearing is 30 kN. The maximum radial load it can sustain to operate at 400 rpm for 9000 hrs is

A. 4.5 kN
B. 5 kN
C. 5.5 kN
D. 5.75 kN

Ans. B

Sol. ball bearing.

Now,

Life = 9000 × 60 × 400 = 216000000 no. of revolution = 216 million revolutions

Using load – life relationship:

$$L_{10} = \left(\frac{C}{P}\right)^n$$

Here, n= 3 (for ball bearing)

$$\Rightarrow 216 = \left(\frac{30}{P}\right)^3$$

$\Rightarrow$ P = 5 kN

So, the correct option is (b).

66. What will be the effect on Euler's crippling load for a column with both ends hinged; if the length of the column is halved?

A. 0.25
B. 0.5
C. 2
D. 4

Ans. D

Sol. Euler crippling load formula is-

Case (i) : When both ends are hinged, then, crippling load,

$$(P_1) = \frac{\pi^2 EI}{L^2}$$

Case (ii): When the length is halved, then,

$$\text{crippling load}, (P_2) = \frac{\pi^2 EI}{\left(\frac{L}{2}\right)^2} = \frac{4\pi^2 EI}{L^2}$$

$$\frac{P_2}{P_1} = \frac{4\pi^2 EI}{L^2} \Big/ \frac{\pi^2 EI}{L^2}$$

$$\frac{P_2}{P_1} = \frac{4\pi^2 EI}{L^2} \times \frac{L^2}{\pi^2 EI}$$

$$P_2 = 4P_1$$

$$\frac{P_2}{P_1} = 4$$

67. Properties of a liquid changing to gas are as follows: h_{fg}=2.184 kJ/kg, v_{fg}= 4 m^3 and Temperature is 273°C. Find The temperature gradient of pressure $\left(\frac{dP}{dT}\right)$ is

A. 4 B. 2

C. 1 D. None of these

Ans. C

Sol. Given

h_{fg}=2.184 kJ/kg, v_{fg}= 4 m^3

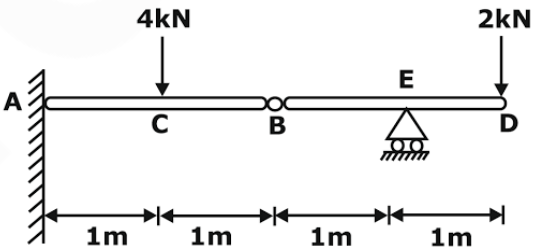
by clausius clapeyron equation,

$$\frac{dP}{dT} = \frac{h_{fg}}{Tv_{fg}}$$

$$\frac{dP}{dT} = \frac{2.184 \times 10^3}{(273+273) \times 4}$$

$$\frac{dP}{dT} = 1$$

68. A beam ACB is hinged at end B with another beam BED, as shown in figure. Determine moment at support A



A. 4 kN -m B. 8 kN-m

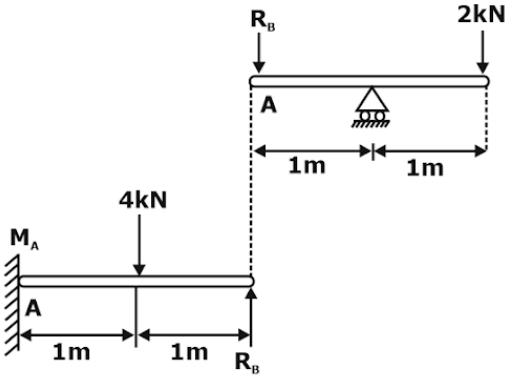
C. 12 kN -m D. 0

Ans. D

Sol. Consider beam BED, roller supported at E, taking moment about E

$2 \times 1 = R_B \times 1$

$\therefore R_B = 2kN$



We have not applied any force at B, reaction $R_B \downarrow$ has to be balanced by $R_B \downarrow$ for beam ACB taking moments about A

$M_A = R_B \times 2 - 4 \times 1 \Rightarrow M_A = 2 \times 2 - 4 \times 1 = 0$

69. When the heat transfer into a system is Greater than the work transfer out of the system, then

A. the internal energy of the system remains constant

B. the internal energy of the system decreases

C. the internal energy of the system increases

D. None of the above

Ans. C

Sol. If Q is the amount of heat transferred to the system and W is the amount of work transferred from the system during the process, then the net energy (Q – W) is stored in the system. This energy is neither heat nor work but it is called as internal energy. As the heat transfer is more that work transfer then the internal energy (ΔE) increases.

70. A circular solid disc of uniform thickness 20 mm, radius 200 mm and mass 20 kg, is used as a flywheel. If it rotates at 600 rpm, the kinetic energy of the flywheel, in Joules is closest to ?

A. 390 J B. 790 J

C. 1590 J D. 3290 J

Ans. B

Sol. Given ,

disc of uniform thickness 20 mm,

radius 200 mm ,

mass 20 kg

$I=0.5xmr^2=0.5 \times 20 \times 0.2^2=0.4\ kg.m^2$

$\omega = 2x\pi x600/60 = 20\pi=62.831\ rad/s$

Therefore, KE of the flywheel =789.54 J which is closest to B.

71. In drawing operation, proper lubrication is essential

A. To improve die life
B. To reduce drawing forces
C. To improve surface finish
D. All of the above

Ans. D

Sol. Proper lubrication is essential in drawing operation because:

* It improve die life
* It reduce drawing forces
* It reduce temperature
* It improve surface finish

So, the correct option is (d).

72. Which of the following is a surface finishing operation?

A. Drilling
B. Honing
C. Milling
D. Turning

Ans. B

Sol. Honing is a surface finishing operation used to give better surface finish and have very small material removal ratE.

73. For a definite ideal refrigeration cycle, the COP of heat pump is found out to be 5. For a situation in which the cycle, under the very condition running as heat engine will have efficiency to be:

A. 0
B. 0.2
C. 1.00
D. 6.00

Ans. B

Sol. $(COP)_{HP} = \frac{Q}{W} = \frac{T_1}{T_1 - T_2} = \frac{1}{\eta}$

$\therefore \eta = \frac{1}{(COP)_{HP}} = \frac{1}{5} = 0.2$

74. Why should the moulding sand be porous?

A. For gases to enter
B. For gases to escape
C. For water to enter
D. For water to escape

Ans. B

Sol. A moulding sand is the one in which, the sand is known to have holes in it and also it is known for holding some amount of moisture content. A moulding should be having pores and should be permeable so that the gases have a free path for escaping.

75. A fluid flowing over a flat plate has kinematic viscosity= 25 x 10^{-6} m^2/s, density = 20 kg/m^3 , Specific heat= 1 kJ/kgK, Thermal conductivity:0.5 W/mK. The hydrodynamic boundary layer thickness is 0.4 mm

The thermal boundary layer thickness is

A. 0.1 mm
B. 0.4 mm
C. 0.5 mm
D. None of these

Ans. B

Sol. First, we have to calculate Prandtl number

$$Pr = \frac{\nu \varrho C_p}{k}$$

$$= \frac{25 \times 10^{-6} \times 20 \times 1000}{0.5}$$

$$Pr = 1$$

$$Pr = \frac{\nu \partial C_p}{k}$$

$$= \frac{25 \times 10^{-6} \times 20 \times 1000}{0.5}$$

Pr = 1

Prantdl number=1 Therefore,

The hydrodynamic boundary layer thickness is 0.4 mm =The thermal boundary layer thickness

76. The circle passing through the upper tips of the teeth is called _____

A. pitch circle
B. circular pitch
C. dedendum circle
D. addendum circle

Ans. D

Sol. Addendum circle is the circle passing through the upper tips of the teeth. The addendum circle lies on the outside cylinder for external gears whereas the addendum circle lies on the internal cylinder for internal gears. The diameter for the addendum circle of an internal gear is called as inside diameter.

77. Two shafts X and Y are made of steel. The diameter of the second shaft is half as that of the first shaft. The ratio of the power of X to Y is

A. 2
B. 4
C. 8
D. 16

Ans. C

Sol. $p = \frac{2\pi NT}{60}, \quad \tau = \frac{16T}{\pi d^3}$

$P \propto T \propto d^3$

$$\frac{P_X}{P_Y} = \left(\frac{2d}{d}\right)^3 = 8$$

The ratio of the power of X to Y is 8.

78. A cubic unit cell satisfies which of the following equations?

A. a=b=c, α=β=ϒ=90 degree
B. a≠b=c, α=β=ϒ=90 degree
C. a=b≠c, α=β=ϒ=90 degree
D. a=b=c, α≠β=ϒ=90 degree

Ans. A

Sol. Simple cubic have all sides equal and all angles equal.

a=b=c, α=β=ϒ=90 degree

79. In a Queuing system arrival rate is 4 cust/hr and service rate is 8 cust/hr then calculate the probability of atleast 3 customer in system-

A. 1/8
B. 8
C. ¼
D. 4

Ans. A

Sol. λ=4, μ=8

ƒ= λ/μ

ƒ=4/8=1/2

probability of having atleast n customer in system

$P=ƒ^n=ƒ^3=(1/2)^3=1/8$

80. Flow of fluid through a pipe is turbulent when

A. Reynolds number is greater than 2000
B. Reynolds number is greater than 4000
C. Reynolds number is less than 2000
D. None of the above.

Ans. B

Sol. For pipe flow, Re<2000: Laminar flow

2000<Re<4000: Transition flow

Re>4000: Turbulent flow

81. A shaft carrying 4 rotors will have following no. of nodes

A. 3
B. 2
C. 1
D. 0

Ans. A

Sol. o If the no. of rotors = n

o Then no. of node points possible= n-1

so ans =4-1= 3

82. Velocity of sliding at the pitch point = $(\omega_p + \omega_g)$ x _____

A. path of contact
B. 0
C. arc of approach
D. path of recess

Ans. B

Sol. o At the pitch point, there is no relative motion between the gears.
o Velocity of sliding at the pitch point = $(\omega_p + \omega_g) \times 0 = 0$.
o Thus, the velocity of sliding is 0.

83. Fluid resistance causes damping which is known as _____
A. Resistance damping
B. Fluid damping
C. Viscous damping
D. Liquid damping

Ans. C

Sol. o Damping due to the resistance offered by the fluid is known as viscous damping.
o This is because of the reduction in the amplitude caused by the viscous forces of the fluid.

84. Which of the following is the hardest constituent of steel?
A. Ludeburite
B. Austenite
C. Bainite
D. Martensite

Ans. D

Sol. Martensite has needle like structure and hence is the hardest form of steel. Martensite has fine grain structure.

85. Positive rake angle is given for machining of:
A. Brittle material
B. Ductile material
C. Both hard and soft material
D. None of the mentioned

Ans. B

Sol. Explanation: Positive rake angle have better chip flow. As the amount of chip flow in ductile material is large, hence positive back rake angle tool will be a better option for machining ductile material.

86. Diesel engine knock can be reduced by:
A. Increasing compression ratio
B. Increasing degree of supercharge
C. Decreasing injection advance
D. All of the above

Ans. D

Sol. Diesel engine knock can be reduced by
- Increasing compression ratio
- Decreasing injection advance
- Increasing degree of supercharge
- By decreasing engine speed

87. If the tearing efficiency of a riveted joint is 60%, then the ratio of the diameter of the rivet hole to the pitch is equal to
A. 0.6
B. 0.4
C. 0.5
D. 1

Ans. B

Sol. If the tearing efficiency of a riveted joint is 60%,

$$\eta = 1 - \frac{d_h}{P}$$

$$0.6 = 1 - \frac{d_h}{P}$$

$$\frac{d_h}{P} = 1 - 0.6 = 0.4$$

88. A certain engine has Indicated Power of 15 kW and mechanical efficiency=80%. The friction power is

A. 15 kW
B. 12 kW
C. 3 kW
D. 3.75 kW

Ans. C

Sol. Given,

Indicated Power=15 kW, mechanical efficiency=80%,

Brake Power=mechanical efficiency x Indicated Power

= 15 x 0.8 kW=12 kW.

Thus, friction power = Indicated Power-Brake Power

= 15-12=3 kW

89. The expression for the ratio of the heights of Porter governor of equal length of arms and links, to the height of a Watt governor is:

A. $\frac{M}{m+M}$
B. $\frac{m}{m+M}$
C. $\frac{m+M}{m}$
D. $\frac{m+M}{M}$

Ans. C

Sol. Height of a Porter governor of equal link and arm length is:

$$h_{porter} = \frac{895}{N^2}\frac{(M+m)}{m}$$

Height of a Watt governor is:

$$h_{watt} = \frac{895}{N^2}$$

Thus:

$$\frac{h_{porter}}{h_{watt}} = \frac{m+M}{m}$$

90. Two cycles coupled in series. The top cycle and the bottom cycle has an efficiency of 30% and 40% respectively. The overall combined cycle efficiency is

A. 70% B. 35%

C. 56% D. 58%

Ans. D

Sol. For two cycles coupled in series, the formula for

The efficiency of the combined cycle is=$\eta_1+ \eta_2- \eta_1\eta_2$

=0.30+.040-(0.30 x 0.40)=0.58

Therefore, the overall combined cycle efficiency is 58%.

91. Consider a Carnot refrigerator working between 200 K & 300 K. Calculate the work requirement, If the refrigerator receives 1 kWof heat

A. 0.5 kW B. 0.67 kW

C. 1.5 kW D. 3 kW

Ans. A

Sol. $COP = \frac{Q}{W} = \frac{T_2}{T_1 - T_2}$

$\therefore W = \frac{1 \times (300 - 200)}{200} kW = 0.5\ kW$

92. On which of the following factors does coefficient of friction depend on

a) Nature of Surface

b) Area of Contact

c) Shape of the Surface

A. Only a B. Only b

C. Only c D. Both a & c

Ans. A

Sol. The value of Coefficient of friction depends solely upon the nature of the surfaces in contact and is independent of the area or shape of the bodies.

93. A circular cross section shaft uniformly tapers from 60mm to 30mm over a length of 300mm. If the shaft is axially loaded with a load of 6000N, then the strain developed is (E = 200GPa)

A. $\frac{40}{E}$ B. $\frac{40}{3E\pi}$

C. $\frac{30}{E\pi}$ D. $\frac{20}{E\pi}$

Ans. B

Sol. Strain developed in shaft =

$$\frac{\Delta l}{l} = \frac{4P}{\pi E d_1 d_2}$$

Substituting the values

$$\text{Strain} = \frac{24000}{\pi E \times 1800} = \frac{40}{3E\pi}$$

94. Which of the following manufacturing processes operates under the influence of external forces?

A. Metal forming
B. Powder metallurgy
C. Casting
D. Welding

Ans. A

Sol. In the metal forming process, the raw material is converted into a desired shape by the application of external force. The metal work piece is subjected to plastic deformation which results in changing of shape and size of the work piece or specimen under the influence of external forces or stresses.

95. Octane number of iso-octane is about

A. 0
B. 50
C. 80
D. 100

Ans. D

Sol. An octane no. is a standard measure of the performance of an engine or aviation fuel. The higher the octane no., the more compression the fuel can withstand before igniting. Its minimum value is 0 and 100 is the maximum value.

96. If number of turns are 8 and wire diameter of spring is 3mm, then solid length of the helical spring is given by?

A. None of the listed
B. 27mm
C. 24mm
D. 21mm

Ans. C

Sol. Given ,

wire diameter of spring is(d) 3mm

number of turns(n) are 8

Solid length=nxd=no of turns x wire diameter

Ls = 8×3 = 24 mm

97. A real body of cross-sectional area A and modulus of elasticity E and length L can be replaced by an equivalent spring of stiffness K, where K is given by?

A. AE/L
B. E/LA
C. L^2E/A
D. LA/E

Ans. A

Sol. Equivalent stiffness of spring,

we know that,

$$\text{deflection}(\delta) = \frac{PL}{AE}$$

$$\delta = \frac{PL}{AE}$$

$$K = \frac{P}{\delta} = \frac{AE}{L}$$

98. In an orthogonal cutting operation the tool has rake angle 300 ,chip thickness before and after cut are 0.4 mm and 0.8 mm , calculate chip reduction coefficient –

A. 2 B. 0.5

C. 4 D. 1

Ans. A

Sol. chip reduction coefficient =chip thickness after cut/chip thickness before cut

chip reduction coefficient =0.8/0.4

chip reduction coefficient =2

99. Displacement thickness is 4 mm, energy thickness is 3 mm and the momentum thickness is 2 mm, the shape factor is

A. $\frac{4}{3}$ B. 2

C. $\frac{3}{4}$ D. $\frac{1}{2}$

Ans. B

Sol. The shape factor is given by

$$\text{Shape factor} = \frac{\text{Displacement thickness}}{\text{Momentum thickness}}$$

$$\text{Shape factor, } H = \frac{\delta}{\theta} = \frac{4}{2} = 2$$

100. Prandtl number is a ratio between

A. Kinematic viscosity to Thermal diffusivity

B. Thermal diffusivity to Kinematic viscosity

C. Dynamic viscosity to Thermal diffusivity

D. Thermal diffusivity to Dynamic viscosity

Ans. A

Sol. o Prandtl number is the dimensionless number which is a property of the fluid defined as the ratio between Kinematic viscosity of the fluid of its Thermal diffusivity.

So the correct option is (a).

101. Nozzle efficiency is described as.....

A. Isentropic heat drop/useful heat drop

B. useful heat drop/isentropic heat drop

C. saturation temperature/supersaturation temperature

D. supersaturation temperature/saturation temperature

Ans. B

Sol. Nozzle efficiency is defined as the ratio of actual heat drop to isentropic heat drop

$$n_N = \frac{\text{actual heat drop}}{\text{isentropic heat drop}} = \frac{\Delta h}{\Delta h_S}$$

$$n_N = \frac{v_2^2 - v_1^2}{v_{2s}^2 - v_1^2} \text{ (if velocity at the inlet is zero)}$$

$$n_N = \frac{v_2^2}{v_{2s}^2}$$

102. The number of steps required for obtaining final solution for a transportation problem is minimum when the initial basic feasible solution is obtained by

A. Modi Method

B. Least Cost Method

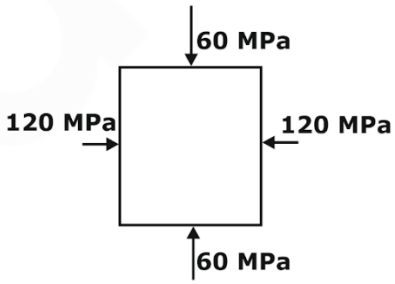
C. North-west corner Method

D. Vogel's Approximation method

Ans. D

Sol. Penalty method also known as Vogel's Approximation method is the best choice to obtain the initial basic feasible solution.

103. Consider a two dimensional state of stress given for an element as shown in the diagram given below:



What are the coordinates of the centre of Mohr's circle?

A. (0,0)

B. (90,0)

C. (-30,0)

D. (-90,0)

Ans. D

Sol. Centre of Mohr's circle is given by

$$= \left(\frac{\sigma_x + \sigma_y}{2}, 0\right) = \left(\frac{-120 + (-60)}{2}, 0\right) = \left(\frac{-180}{2}, 0\right) = (-90, 0)$$

104. The position of a particle in rectilinear motion is given by the equation ($x = t^3 - 2t^2 + 10t - 4$), where x is in meters and t is in seconds. What will be the velocity of the particle at 3s?

A. 20 m/s
B. 25 m/s
C. 15 m/s
D. 30 m/s

Ans. B

Sol. Given

Position (x) = t3 – 2t2 + 10t – 4

Velocity (v) = $dx/dt = 3t^2 - 4t + 10$

At t = 3 s

V = $3 \times 3^2 - 4 \times 3 + 10 = 25$ m/s

105. In which of the following refrigeration cycle, does the waste heat gets effectively used?

A. Vapor compression cycle
B. Vapor absorption cycle
C. Air refrigeration cycle
D. Vapor expansion cycle

Ans. B

Sol. Consider the following statement regarding VARS

- VARS is a heat operating device that works on low-grade energy.
- It is used extensively where waste heat is available.

106. Two radiating surface $A_1 = 6\ m^2$ and $A_2 = 4\ m^2$ have shape factor $F_{12} = 0.1$. Then the shape factor F_{21} will be

A. 0.12
B. 0.18
C. 0.15
D. 0.10

Ans. C

Sol. Given,

$A_1 = 6\ m^2$, $A_2 = 4\ m^2$ and shape factor $F_{12} = 0.1$

we know that,

$A_1 F_{12} = A_2 F_{21}$.

$6 \times 0.1 = 4 \times F_{21}$

$F_{21} = 0.15$

107. Clearance ratio in reciprocating compressor is given by

A. total volume / swept volume
B. total volume / clearance volume
C. swept volume / clearance volume
D. clearance volume / swept volume

Ans. D

Sol. Clearance ratio in reciprocating compressor is the ratio of clearance volume to swept volume.

Clearance ratio (c)=(clearance volume/swept volume)

C =Vc/Vs.

108. Ratio of maximum velocity to average velocity for laminar flow between flat plates

A. 2 B. ½

C. 1.5 D. 1/1.5

Ans. C

Sol. $u = \frac{-1}{2\mu} \times \frac{\partial p}{\partial x} \times \left(H \times y - y^2\right)$

maximum velocity at y=H/2

$U_{max} = \frac{-1}{8\mu} \times \frac{\partial p}{\partial x} \times H^2$

$U_{mean} = \frac{-1}{12\mu} \times \frac{\partial p}{\partial x} \times H^2$

$\frac{U_{max.}}{U_{mean}} = 1.5$

109. If the principal stress in plane stress problem σ_1 = 200 MPa, σ_2 = 50 MPa, the magnitude of the maximum IN PLANE shear stress (in MPa) will be

A. 125 MPa B. 100 MPa

C. 75 MPa D. None of these

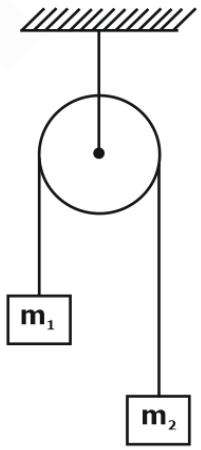
Ans. C

Sol. Given,

σ_1 = 200 MPa, σ_2 = 50 MPa

In plane shear stress = $\frac{\sigma_1 - \sigma_2}{2} = \frac{200 - 50}{2}$ = 75 MPa

110. Find acceleration of mass m_1 ($m_2 > m_1$) assuming pully is massless and friction less

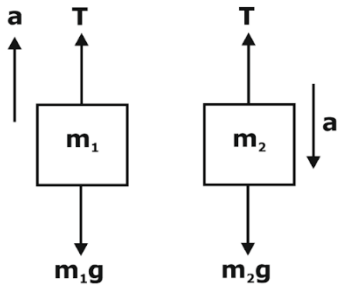


A. $\frac{(m_2 + m_1)g}{m_2 - m_1}$ B. $\frac{(m_2 - m_1)g}{(m_2 + m_1)}$

C. $\frac{(m_2 + m_1)g}{m_1}$ D. $\frac{(m_2 - m_1)g}{m_1}$

Ans. B

Sol.



$T = m_1g + m_1a$ …(1)

$T + m_2a = m_2g$ …(2)

$\Rightarrow T = m_2g - m_2a$ ….(2)

From (1) and (2)

$m_2g - m_2a = m_1g + m_1a$

$$\Rightarrow a = \frac{(m_2 - m_1)g}{(m_2 + m_1)}$$

111. Rotational flow is when

A. Fluid has a rotating moment along with flowing downstream

B. Fluid particles rotate about their own mass centres along with flow

C. Both a and b

D. None of these

Ans. B

Sol. Bulk rotational movement of fluid doesn't make fluid particles rotate. Rotation occurs when fluid particles rotate by torque due to viscosity about their own infinitesimal mass centres.

112. The fixed cost for a small- scale industry is Rs 2,00,000. Variable cost per unit is Rs 50. The sales is expected at Rs 4,00,000. The Selling price of each unit is Rs 100. The Breakeven point will be:

A. 3500 units B. 4000 units

C. 4500 units D. 5000 units

Ans. B

Sol. Units at Break even point $= \dfrac{\text{Fixed price}}{\text{Sales price per unit} - \text{Variable cost per unit}}$

$= \dfrac{2,00,000}{100 - 50} = \dfrac{2,00,000}{50} = 4000$ units

So, the correct option is (b).

113. A strip is to be rolled from a thickness of 30 mm to 15 mm using a two high mill having rolls of diameter 300 mm. The coefficient of friction for unaided bite should be.

A. 0.32 B. 0.5

C. 0.25 D. 0.07

Ans. A

Sol Given

$t_{initial}$= 30 mm,

t_{final} = 15 mm

radius = 150 mm

$$\mu = \sqrt{\frac{\Delta h}{R}} = \sqrt{\frac{(30-15)}{150}} = \sqrt{\frac{15}{50}}$$

$$= \sqrt{0.1} = 0.316$$

114. The peak to valley surface roughness in a machining operation is 40 μm. Assuming that the surface roughness profile is triangular, the center – line average surface roughness is

A. 4μm B. 10μm

C. 5μm D. 20μm

Ans. B

Sol. Peak to valley surface roughness (H_{max}) = 40 μm

$$H_{avg} = \frac{H_{MAX}}{4} = \frac{40\ \mu m}{4} = 10\ \mu m$$

115. Which of the following method is used to determine the slope and deflection at a point?

A. Arithmetic increase method B. Mathematical curve setting

C. Macaulay's method D. Lacey's method

Ans. C

Sol. Macaulay's method was devised by Mr. WH Macaulay.

Advantages:

- Gives one continuous expression for bending moment.
- Constants of integration can be found by using end conditions.
- By using this method, slope and deflection at any section can be determined throughout the length of the beam.

116. Mechanism of material removal in Electron Beam Machining is due to _____

A. mechanical erosion due to impact of high of energy electrons

B. chemical etching by the high energy electron

C. sputtering due to high energy electrons

D. melting and vaporisation due to the thermal effect of impingement of high energy electron

Ans. D

Sol. EBM is typically used with higher power density to machine materials. The mechanism of material removal is primarily by melting and rapid vaporisation due to intense heating by the electrons and laser beam respectively.

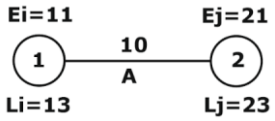
117.Continuous chips with built up edge are formed during machining of

A. brittle metals
B. ductile metals
C. hard metals
D. soft metals

Ans. B

Sol. Explanation: Discontinuous chips are formed during machining of brittle metals while continuous chips with built up edge are formed during machining of ductile materials at low cutting speed.

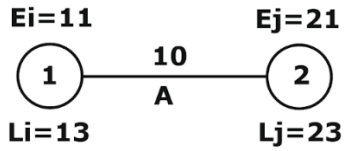
118. For an activity A shown in the figure below. Calculate the total float. The numbers mentioned are days.



A. 10
B. 2
C. 12
D. 8

Ans. B

Sol. Given,



Total float is given as, $L_j - E_i - T_{i-j}$

Total Float = 23 – 11 – 10 = 2 days. [Ans]

119. Navier-Stokes equation, Bernoulli's Principle and Continuity equation, respectively work on the principles of conservation of

A. Mass, Energy, and Momentum
B. Energy, Momentum, and Mass
C. Momentum, Energy, and Mass
D. Momentum, Mass and Energy

Ans. C

Sol. Navier-Stokes equation, Bernoulli's Principle and Continuity equation work on the principles of conservation of momentum, energy, and mass respectively.

120. Which of the following is true regarding the ratio of tension on the tight side to that of slack side in a belt drive?

A. proportional to lap angle
B. proportional to coefficient of friction
C. proportional to product of coefficient of friction and lap angle
D. an exponential function of the product of coefficient of friction and lap angle

Ans. D

Sol. The ratio of tension on the tight side to that of slack side in a belt drive an exponential function of the product of coefficient of friction and lap angle

$$\frac{T_{high}}{T_{low}} = e^{\mu\theta}$$

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