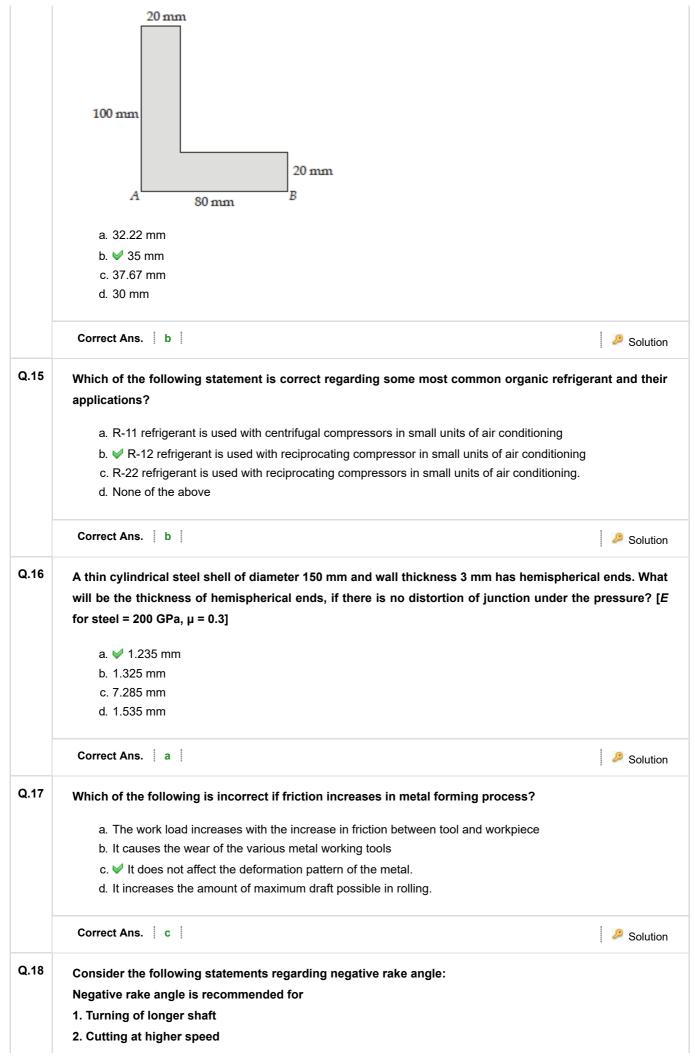


# Solution Report For All India Mock GATE 2019: CBT-2 (ME)

Q. No	Question Status					
Q.1	Choose the correct set of words to complete the sentence:					
	Politicians must be for the people, but the	ey should never befor public welfare.				
	a. ⊌ disinterested, uninterested					
	b. disinterested, disinterested					
	c. uninterested, uninterested					
	d. uninterested, disinterested					
	Correct Ans.   a	Solution				
Q.2		of them has an error, identify that part of the sentence:				
	Raja Ram Mohan Roy's religious rel	form movement brought through a change				
	(1)	(2)				
	in the position of women in Indian	society				
	(3) (4)					
	a. 1					
	b. <b>⊌</b> 2					
	c. 3					
	d. 4					
	Correct Ans.   b	Solution				
Q.3	The value of $\left[\frac{1}{\log_{(p/q)} x} + \frac{1}{\log_{(q/r)} x} + \frac{1}{\log_{($	$\left[\frac{1}{5(r/p)^X}\right]$ is				
	a. 3					
	b. 2					
	c. 1					
	d. <b>৺</b> 0					
	Correct Ans. d	Solution				
Q.4	How many numbers between 1 to 300 are divisible by only 11 or only 13 but not by both?					
	a. 45					
	b. ₩ 46					
	c. 48					
	d. 50					
	Correct Ans.   b	Solution				
		·				

Cor	Correct Ans. 24 Solution				
2.6	A sphere is inscribed in a cube with an edge of 10 units. What is the shortest possible distance in units from one of the vertices of the cube to the surface of the sphere?				
	a. $10(\sqrt{3}-1)$				
	b. 5				
	c. $10(\sqrt{2}-1)$				
	c. $10(\sqrt{2}-1)$ d. $\checkmark$ $5(\sqrt{3}-1)$				
	Correct Ans.   d	. ♣ Solutio			
7					
Q.7	Five kilograms of oranges contained 98% of water. If the next day, after some water evaporated, the concentration of water decreased to 96%, what was the new weight of the oranges, in kilograms?				
	a. 4.9				
	b. 4.8				
	b. 4.8				
	<ul><li>b. 4.8</li><li>c. ✓ 2.5</li></ul>				
Q.8	b. 4.8 c. № 2.5 d. 2.4				
Q.8	b. 4.8 c. ✓ 2.5 d. 2.4  Correct Ans.   c	vered by A in 4 hops is equal to distance			
Q.8	b. 4.8 c.   2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, peothat A takes 3 hops, B takes 4 hops but the distance contact the sack race (In a sack race).	ple hop to reach the finish line). In the time			
Q.8	b. 4.8 c.   2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, peothat A takes 3 hops, B takes 4 hops but the distance cocovered by B in 5 hops. What is the ratio of A's speed: B's speed:	ple hop to reach the finish line). In the time			
2.8	b. 4.8 c. ✓ 2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, peothat A takes 3 hops, B takes 4 hops but the distance cocovered by B in 5 hops. What is the ratio of A's speed: B's sack race (B's speed: B's speed:	ple hop to reach the finish line). In the time			
1.8	b. 4.8 c.   2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, peopthat A takes 3 hops, B takes 4 hops but the distance corcovered by B in 5 hops. What is the ratio of A's speed: B's specific B's spec	ple hop to reach the finish line). In the time			
1.8	b. 4.8 c. ✓ 2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, peothat A takes 3 hops, B takes 4 hops but the distance cocovered by B in 5 hops. What is the ratio of A's speed: B's specific by 12:20 c. ✓ 15:16	ple hop to reach the finish line). In the time vered by A in 4 hops is equal to distance peed?			
_	b. 4.8 c. ✓ 2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by 12:20 c. ✓ 15:16 d. 1:1	ple hop to reach the finish line). In the time vered by A in 4 hops is equal to distance peed?			
_	b. 4.8 c. ✓ 2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by the same of the same of the sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by the same of the sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by the sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by the sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's	ple hop to reach the finish line). In the time vered by A in 4 hops is equal to distance peed?  Page 2 Solution wo siblings and the product of the age of all the product of the product o			
_	b. 4.8 c. ≥ 2.5 d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's speed:	ple hop to reach the finish line). In the time vered by A in 4 hops is equal to distance peed?  Page 2 Solution wo siblings and the product of the age of all the product of the product o			
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_	b. 4.8 c. \$\issup 2.5\$ d. 2.4  Correct Ans.   c    A and B will participate in a sack race (In a sack race, people that A takes 3 hops, B takes 4 hops but the distance concovered by B in 5 hops. What is the ratio of A's speed: B's specified by 12:20 c. \$\issup 15:16\$ d. 1:1  Correct Ans.   c    When I asked a beggar about his age, he said that he has to three is 15, and sum of their ages is an odd number. What sibling?  a. 1	ple hop to reach the finish line). In the tim vered by A in 4 hops is equal to distanc peed?  Political Solution wo siblings and the product of the age of a			

	Correct Ans. d		₽ Solution			
Q.10	A teacher prepares a test. She gives 5 objective type questions out of which 4 have to be answered. The total ways in which they can be answered if the first 2 questions have 3 choices and the last 3 have 4 choices is					
	Correct Ans.   816		Solution			
Q.11	An open rectangular box of base 2 m × 2 m contains a liquid of specific gravity of 0.8 upto a height of					
	3.5 m. If the box is imparted with vertically upward acceleration of 5.19 m/s <sup>2</sup> , what will be the pressure					
	on the base? $(g = 9.81 \text{ m/s}^2)$					
	a. 29.40 kPa					
	b. <b>⊌</b> 42 kPa					
	c. 32 kPa					
	d. 51 kPa					
	Correct Ans.   b		Solution			
Q.12	A rigid tank contains 5 kg	of refrigerant 134a, initially at	20°C and 140 kPa. The refrigerant is now cooled			
	while being stirred until its pressure drops to 100 kPa. What will be the dryness fraction of the					
	refrigerant at the end of the	e process?				
	At state 1:	$P_1 = 140 \text{ kPa},$	$T_1 = 20$ °C, $v_1 = 0.16544 \text{ m}^3/\text{kg}$			
	At state 2:		$v_f = 0.0007259 \text{ m}^3/\text{kg}, v_g = 0.19254 \text{ n}$			
	- 0.450	-	,			
	a. 0.452 b. 0.570					
	c. 0.667					
	d. <b>⊌</b> 0.859					
	Correct Ans.   d		Solution			
Q.13	A machine component is subjected to a completely reversed axial loading of magnitude 100 MPa. If the					
	permissible yield strength for the material is 220 MPa and corrected endurance limit is 150 MPa, the					
	factor of safety is					
	a. <b>⊌</b> 1.5					
	b. 2					
	c. 3					
	d. 1.25					
	Correct Ans.   a		Solution			
Q.14	What is the distance of cer	nter of mass of this 'L' shaped	figure from base AB?			



- 3. Machining high strength alloys
- 4. Brittle cutting tools

Which of the above statements are correct?

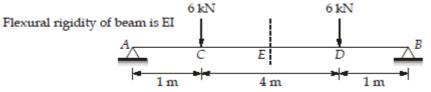
- a. 1, 3 and 4
- b. 1 and 3
- c. 🔰 2, 3 and 4
- d. 1, 2 and 4

Correct Ans. c



Q.19

A beam is loaded as shown in figure, what is slope at A? (where El is in kNm²)



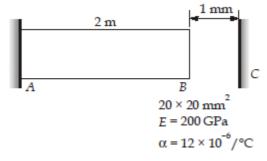
- a. 🤟
  - 15
  - 30
- $\sim \frac{\overline{El}}{El}$
- 18
- c. *EI* 
  - 10

Correct Ans. a



Q.20

A bar AB is fixed at one end. For how much increase in temperature this bar will buckle, if this bar AB acts as fixed beam after touching end C of wall?



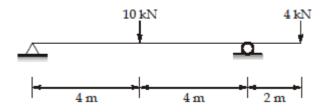
- a. 62°C
- b. 65°C
- c. 73°C
- d. ₩ 69°C

Correct Ans. d



Q.21

Beam is loaded as shown in the figure, what is maximum shear force in the beam?



- a. 4 kN
- b. 10 kN
- c. ₩ 6 kN
- d. 5 kN

Correct Ans. c



## Q.22 If the stream function is given by $\psi = 3xy$ , then the velocity at a point (3, 2) will be

- a. 7.8 m/s
- b. 10.11 m/s
- c. 11.39 m/s
- d. 🔰 10.816 m/s

Correct Ans. d



#### Q.23 Which of the following statements are correct regarding operations performed on rolls generally?

- a. 

  ✓ Hot rolls are roughened whereas cold rolls are ground.
- b. Both hot rolls and cold rolls are roughened.
- c. Hot rolls are ground and cold rolls are roughened.
- d. Both hot rolls and cold rolls are ground.

Correct Ans. a



# Q.24 What is the probability that a divisor of 10<sup>99</sup> is a multiple of 10<sup>96</sup>?

$$\frac{1}{1000}$$

h ы

$$\frac{1}{625}$$

c 125

96

Correct Ans. | b |



### Q.25 For the partial differential equation

$$\frac{(x-1)}{2}\frac{\partial^2 u}{\partial x^2} + B\frac{\partial^2 u}{\partial x\,dy} + \frac{(x+1)}{2}\frac{\partial^2 u}{\partial y^2} + \frac{\partial u}{\partial y} = u$$

to be parabolic, what should be the value of  $B^2$ ?

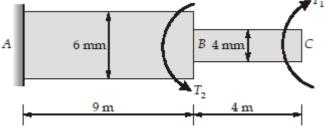
	$\sqrt{x^2-1}$
	$\frac{x+1}{2}$
	$\frac{x-1}{2}$
	cd. ⊌
	$x^2 - 1$
	Correct Ans.   d
Q.26	An oil filled thermometer well made up of steel tube (100 mm long) is installed in a tube through which air is flowing. The temperature of the air stream is measured with the help of the thermometer placed in the well. The temperature recorded by the thermometer is 88°C. The magnitude of measurement error (in°C) if the temperature at the base of the well is 40°C will be
	The temperature equation for the excess temperature ( $\theta$ ) of thermometric well surface at the distance x meter from the base is given by:
	$\frac{d^2\theta}{dx^2} - 400\theta = 0$
	[Neglect heat loss from the tip of well]
	Correct Ans.   17.37 (16 - 19)
Q.27	A piping system, consists of three pipes arranged in series, the length of the pipes are 1200 m, 1750 m and 600 m and diameters are 750 mm, 680 mm, 850 mm respectively. The equivalent length of pipe of diameter 680 mm ism. (Consider same friction factor for all pipes).
	Correct Ans.   2681.83 (2650 - 2700)
Q.28	Fixed cost of production is ₹5000. If selling price is ₹70 per unit, variable price per unit to get breakeven at 900 unit is ₹
	Correct Ans. 64.44 (64 - 65)
Q.29	An inventory of an item whose annual demand is 70000 units has carrying cost of ₹5 per unit per year. If ordering cost per order is ₹600, economic order quantity isunits.
	Correct Ans. 4098.78 (4090 - 5010)
Q.30	A turning operation is being carried out on a Lathe machine. The required finish on the part can be achieved by turning three passes. If the cutting velocity is 5 m/min, diameter of part is 5 cm, length of workpiece is 15 cm and feed is 1 mm/rev, then the total time for machining is minutes.

	Correct Ans.   14.14 (14.00 - 14.30)				
Q.31	A hollow casting is produced using a core which is in shape of frustum of cone of height 10 cm with 4 cm and 6 cm diameters. If density of liquid metal is 7500 kg/m <sup>3</sup> and density of core material is 1400				
	kg/m <sup>3</sup> , net buoyancy on core in Newton is (Use g = 10 m/s <sup>2</sup> )				
	Correct Ans.   12.137 (12.00 - 12.30)				
Q.32	In a power plant, the efficiency of the electric generator, turbine, boiler and the overall plant are 0.97, 0.95, 0.92 and 0.33, respectively. The percentage of total electricity generated is consumed in running the auxiliaries is 7.32%. The cycle efficiency of the power plant is				
	Correct Ans. 0.42 (0.41 - 0.43)				
Q.33	Stress tensor matrix is given below:				
	[30 0 0]				
	30 0 0 0 40 0 All units are in MPa 0 0 -50				
	[ 0 0 -50] The maximum shear stress is MPa.				
	The maximum shear stress is wir a.				
	Correct Ans. 45 Solution				
Q.34	The third approximation of $x^3$ – $4x$ – $9$ = $0$ in [2, 3] by bisection method is (upto 3 decimal places)				
	Correct Ans.   2.625 (2.620 - 2.630)				
Q.35	A matrix $A = [a_{ij}]_{15 \times 15'}$ where $a_{ij} = \begin{cases} i & \forall & i = j \\ 0 & \forall & i \neq j' \end{cases}$ then sum of eigen values of $A$ will				
	be				
	Correct Ans.   120				
Q.36	A bar is subjected to fluctuating tensile load from 30 kN to 110 kN. The material has yield strength of 220 MPa and endurance limit is 150 MPa. According to soderberg principle, the area of cross section in				
	mm <sup>2</sup> of the bar for a factor of safety of 2.5 is				
	a. ₩ 1462.12				
	b. 1362.33				
	c. 1413.33				
	d. 1493.12				
	Correct Ans. a Solution				

2/10/2019

MADE EASY CBT Q.37 A lightly loaded full journal bearing has journal diameter of 50 mm, bush bore of 50.05 mm and bush length of 40 mm. If rotational speed of journal is 1000 rpm and average viscosity of liquid lubricant is 0.03 Pa.s, the power loss (in Watt) will be a. 49.732 b. 54.677 c. 36.706 d. 🤟 51.677 Correct Ans. d Q.38 A 90 cm diameter spherical vessel is completely filled up with a liquid of specific gravity 0.75, the vessel and the liquid are then rotated about the vertical axis, without relative motion, at a rotational speed of 60 rpm. (Take g = 10 m/s<sup>2</sup>). The points of maximum pressure lie on a horizontal plane below the centre of sphere by a. 45 cm b. 29.43 cm c. ₩ 25.33 cm d. 20.33 cm Correct Ans. c Q.39 B 4 mm 6 mm

In the stepped shaft with torques applied, the total stored strain energy is\_\_\_\_ kN-m.



Use  $T_1 = 50$  Nm,  $T_2 = 70$  Nm and G = 110 GPa

- a. 🤟 1.937
- b. 2.237
- c. 1.737
- d. 2.437

Correct Ans. a

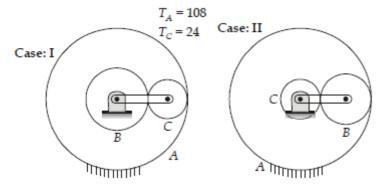
Q.40

Solution

Solution

Solution

In the shown epicyclic gear train gear A is fixed, gear C is rotating in clockwise direction with a speed of 125 rpm.



If the speed of arm in Case: I is a and speed of the arm in Case: II is b when position of B and C is interchanged, then value of |b - a| will be

- a. 1.359 rad/sec
- b. ₩ 6.120 rad/sec
- c. 35.714 rad/sec
- d. 2.381 rad/sec

Correct Ans. b



Q.41

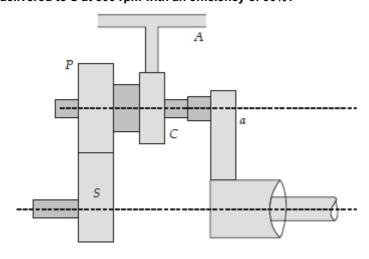
A metal joined using MIG welding require 20 J/mm<sup>3</sup> for melting. 30 Volt and 250 A power source is used. If melting efficiency is 80% and weld area is 2 mm<sup>2</sup> and welding speed is 100 mm/s, then what is the arc heat transfer efficiency?

- a. ¥ 66.67%
- b. 33.33%
- c. 53.33%
- d. None of above

Correct Ans. a



Q.42 For the gear train as shown in figure,  $T_S = 24$ ,  $T_P = 30$ ,  $T_C = 18$ ,  $T_A = 90$ . P and C form a compound gear carried by the arm a and annular gear A is held stationary. What is fixing torque required on A if 5 kW is delivered to S at 800 rpm with an efficiency of 90%?



- a. 459 Nm
- b. 521 Nm
- c. 224 Nm
- d. 🔰 329.86 Nm

Correct Ans. d



Q.43

Hartnell governor with equal arms, when sleeve is in midposition, the masses rotate in a circle with a diameter of 150 mm (arms are vertical in mid position). Neglecting friction, equilibrium speed for this position is 240 rpm. Maximum variation of speed when friction is taken into account is 10% of mid position speed, for a maximum sleeve movement of 30 mm. The sleeve mass is 5 kg and friction at the sleeve is 35 N.

Assuming that power of governor is sufficient to overcome the friction by 1% change of speed on each side at mid position, what is the stiffness of spring?

- a. 25.67 N/mm
- b. 🤟 44.56 N/mm
- c. 86.17 N/mm
- d. 22.43 N/mm

Correct Ans. b



Q.44 A real gas follows the following relation:

$$\left(P + \frac{a}{V^2}\right)(V - b) = mRT$$

Where *P* is pressure in kPa, V is volume in m<sup>3</sup> and m is mass of gas in kg (a and b are constants). If the system goes isothermally from 1 m<sup>3</sup> to 10 m<sup>3</sup> at a temperature of 293 K, then what will be the work done by the system?

Use the values,  $a = 155 \text{ kNm}^4$ ,  $b = 0.98 \times 10^{-2} \text{ m}^3$ , m = 10 kg and R = 0.287 kJ/kgK

- a. 2204 kJ
- b. 🔰 1804 kJ
- c. 1733.33 kJ
- d. 1656 kJ

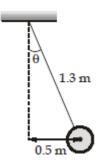
Correct Ans. b

Q.45

Q.46



A sphere of 300 gm is attached to an inextensible string of length 1.3 m, whose upper end is fixed to the ceiling. The spring is made to describe a horizontal circle of radius 0.5 m. What is angular velocity of sphere?

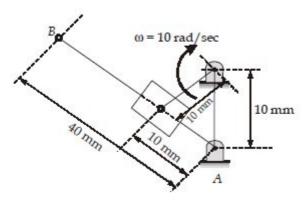


- a. ₩ 2.859 rad/sec
- b. 7.23 rad/sec
- c. 8.86 rad/sec
- d. 10.2 rad/sec

Correct Ans. a



For the given crank and slotted bar mechanism. What will be the velocity of slider with respect to slotted link AB and angular velocity of link AB respectively?



- a. 50 mm/s, 5 rad/s
- b. 50 mm/s, 8.66 rad/s
- c. 86.6 mm/s, 8.66 rad/s
- d. ₩ 86.6 mm/s, 5 rad/s

Correct Ans. d



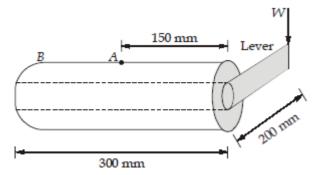
Q.47 A straight bar of steel 2.4 m long of rectangular section, 3 cm × 1.6 cm is used as a strut with both ends hinged. Assuming that Euler's formula is applicable and material attains its yield strength at time of buckling. What will be the central deflection in bar? [*E* = 210 GPa, yield strength = 270 MPa]

- a. 46 mm
- b. 63 mm
- c. 125 mm
- d. 🤟 91 mm

Correct Ans. d



Q.48 A hollow steel pipe is loaded as shown in the figure, with  $d_0 = 120$  mm,  $d_i = 100$  mm



What is the value of W if maximum principle stress at point A on top of pipe doesn't exceed 80 MPa?

- a. 25.49 kN
- b. 38.47 kN
- c. 🗸 35.13 kN
- d. 28.29 kN

Correct Ans. c



Q.49 A small geothermal well in a remote desert area produces  $\dot{m} \square$  kg/h of saturated steam vapour at  $T_1$  K. The environment temperature is  $T_0$  K. This geothermal steam will be suitably used to produce cooling for homes at T K. The steam will emerge from this system as saturated liquid at 1 atm. What will be the maximum cooling rate that could be provided by such a system?

[Symbol have their usual meanings]

$$\frac{\dot{m}(h_1 - h_2)}{\left(\frac{T_0}{T} - 1\right)}$$
a.
b.  $\forall$ 

$$\frac{\dot{m}[(h_1 - T_0s_1) - (h_2 - T_0s_2)]}{\left(\frac{T_0}{T} - 1\right)}$$

$$\frac{\dot{m}(h_1 - h_2)}{\left(1 - \frac{T_0}{T}\right)}$$
c.
$$\frac{\dot{m}[(h_1 - T_0s_1) - (h_2 - T_0s_2)]}{\left(1 - \frac{T_0}{T}\right)}$$
d.

Correct Ans. | b |



Q.50 The maximum value of f(x) = x(x-1)(x-2) in the interval [1, 2] is

- a. -0.384
- b. 0.384
- c. 🤟 0
- d. -0.375

Correct Ans. c



Q.51

The nullity of  $A = \begin{bmatrix} 2 & 3 & 7 \\ 1 & 1 & 9 \\ 9 & 2 & x \end{bmatrix}$  is 1, then the value of  $\overline{x}$  will be

- a. 6
- b. 7
- c. 11
- d. W None of these

Correct Ans. d

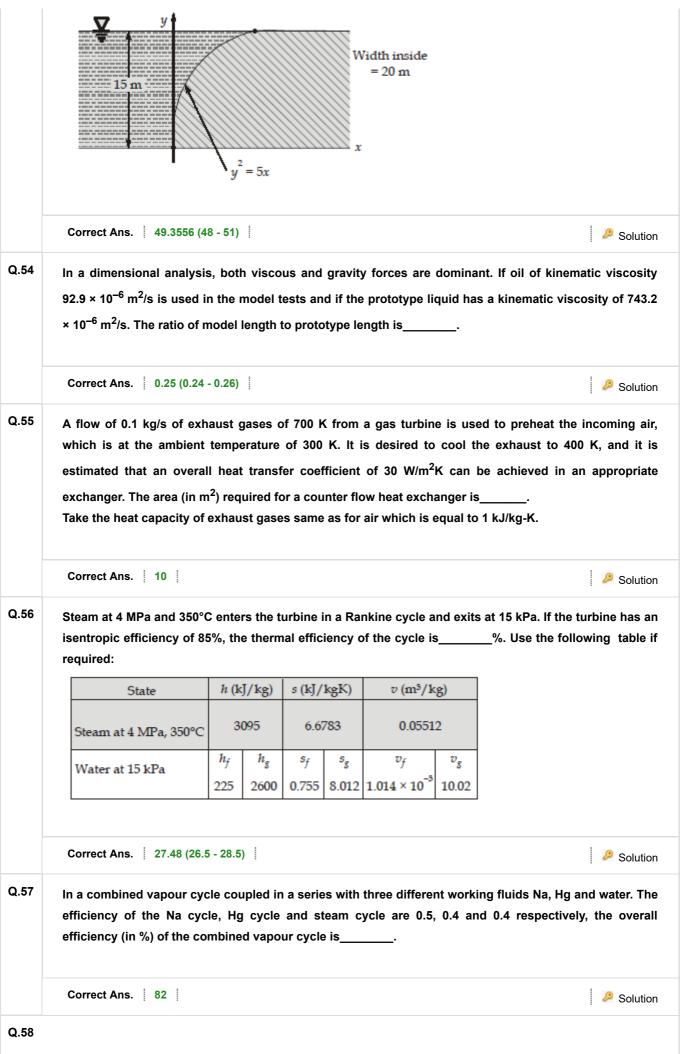


Q.52 A stepper motor has 150 steps. The output shaft of the motor is directly coupled to a lead screw of pitch 5 mm, which drives a table. If the frequency of pulse supply to the motor is 250 Hz, the speed of the table is \_\_\_\_\_\_ mm/min.

Correct Ans. 500 (499 - 501)



Q.53 A dam is having a curved surface as shown in the figure. The net force acting on the dam is \_\_\_\_\_\_ MN. Use  $\rho_{water} = 1000 \ kg/m^3$ ,  $g = 9.81 \ m/s^2$ .



		-				is 5800 K and the solar insolation on the earth is to that of sun is
Cor	rect Ans.	214	I.08 (213	- 215)		Solution
Q.59	In an aircraft refrigeration system air enters the compressor at 298 K. The pressure ratio of the system is 5. Air exits the condenser at 270 K and enters the expander. If the actual COP of the system is 50% of ideal, the power required for refrigeration for 3 kg/s of air is kW. [Use $\gamma = 1.4$ and $C_p = 1.005 \ kJ/kgK]$					
	Corre	ect Ans	. 449	.18 (448 - 450	0)	Solution
Q.60	respe carryi	ctively	and the	ree stores	P, Q and R who	plants A, B and C which produces 50, 60 and 40 units ose demand is 25, 35 and 60 units respectively. If the rix form, total transportation cost after allocation using
Q.61	In a M	I/M/1 q		g model, arr		erson per hour and service rate is 3 person per hour. The queue is (Correct upto 2 decimal place)
_				316 (0.12 - 0.1		Solution
Q.62	The value of Grashoff number for a horizontal square plate of side 3 m is × 10 <sup>9</sup> . The properties at mean temperature are: $\beta = 0.003125~k^{-1},  v = 1.78 \times 10^{-5}~m^2/s,  T_{atm} = 320~K,  T_{plate} = 374~K$					
	Correct Ans. 2.204 (2.1 - 2.3)					Solution
Q.63	Air contains 79% $N_2$ and 21% $O_2$ on a molar basis. A hydrocarbon fuel ( $C_2H_6$ ) is burned with 50% excess air than required stoichiometrically. Assume complete combustion of fuel, the molar percentage of $N_2$ in the products is					
	tne pr	oducts	s is	<u> </u>		

Q.64	If $y' - x \neq 0$ and $y(0) = 2$ , then value of $y(1)$ for differential equation $y'(y' + y) = x(x + y)$ would be (Upto 3 decimal places)				
	Correct Ans. 0.367 (0.360 - 0.370)	Solution			
Q.65	A coin is tossed till tail appears for the first time. The average number of tosses required	is			
	Correct Ans.   2	Solution			