



ACE

Engineering Academy



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GATE - 2015 - Mechanical Engineering (ME)

(Questions Based on Memory of Students)

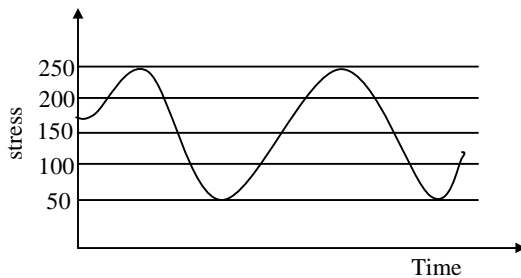
SET - 3 (01st Feb. Forenoon Session)

1 Mark Questions

01. Apparent lifelessness _____ dormant life.
 (a) harbours (b) leads to
 (c) supports (d) effects
02. The boy from town was a _____ in the sleepy village.
 (a) dog out of herb (b) sheep from heap
 (c) fish out of water (d) bird from flock
03. Tanya is older than Eric.
 Cliff is older than Tanya
 Eric is older than cliff
 If the first two statements are true, the third statement is
 (a) True (b) False
 (c) Uncertain (d) Data insufficient
04. Five teams have to compete a league with every team playing with every other team exactly once, before going to the next round. How many matches will they have to play to complete league round of matches.?
 (a) 20 (b) 10 (c) 8 (d) 15
05. A coin is tossed thrice. Let 'x' be the event head occur in each of first two tosses. Let 'y' be event where tail occurs in third toss, and 'z' be the event tail occurs in two tosses. Based on the above information
 (a) X and Y are independent
 (b) Y and Z are dependent
 (c) Y and Z are independent
 (d) X and Z are independent
06. $\lim_{x \rightarrow 0} \left(\frac{-\sin x}{2 \sin x + x \cos x} \right)$ is _____.
07. Couette flow is
 (a) Steady incompressible, laminar flow in straight circular pipe
 (b) Fully developed turbulent flow in straight circular pipe
 (c) Steady incompressible, laminar flow between two parallel plate
 (d) Steady incompressible, laminar flow between one fixed plate and other moving with constant velocity
08. A rigid container of volume 0.5 m^3 contains 1 kg of water at 120°C ($v_f = 0.00106 \text{ m}^3/\text{kg}$, $v_g = 0.8908 \text{ m}^3/\text{kg}$). The state of water
 (a) compressed liquid
 (b) Saturated liquid
 (c) A mix of saturated liquid and saturated vapour
 (d) Superheated Vapour
09. Ratio of momentum diffusivity (ν) to thermal diffusivity (α) is called
 (a) Prandtl number (b) Nusselt number
 (c) Biot number (d) Lewis number



10. For given fluctuating fatigue load, the value of stress amplitude and stress ratio are respectively.

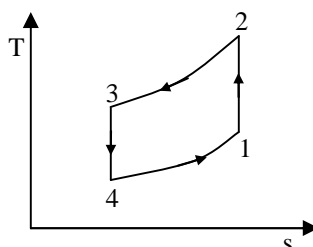


- (a) 100 MPa and 5 (b) 250 MPa and 5
(c) 100 MPa and 0.20 (d) 250 MPa and 0.20
11. Which two of the following joining process are autogenous.
- (i) Diffusion welding
(ii) Electro slag welding
(iii) Tungsten inert gas welding
(iv) Friction welding
- (a) (i) and (iv) (b) (ii) and (iii)
(c) (ii) and (iv) (d) (i) and (iii)

12. In notation (a/b/c) : (d/e/f) for summarizing the characteristics of queuing situation, the letters 'b' and 'd' stand respectively for
- (a) Service time distribution and queue discipline
(b) Number of servers and size of calling source
(c) Number of servers and queue discipline
(d) Service time distribution and maximum number of allowed in system

13. Strain hardening Exponent, 'n' of stainless steel SS304 with distinct yield and UTS value undergoing plastic deformation is
- (a) $n < 0$ (b) $n = 0$ (c) $0 < n < 1$ (d) $n = 1$

14. The thermodynamics cycle shown in figure (T-s diagram) indicates

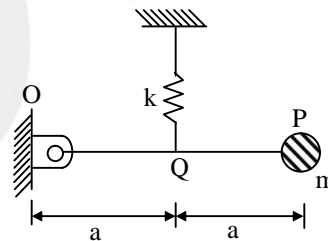


- (a) Reversed Carnot cycles
(b) Reversed Brayton cycle
(c) Vapor compression cycle
(d) Vapor absorption cycle

15. In a machining operation if the generatrix and directrix both are straight line the surface obtain is
- (a) cylindrical (b) helical
(c) Plane (d) Surface of resolution
16. In full mould (cavity less) casting process the pattern is made of
- (a) expanded polystyrene
(b) WAX
(c) epoxy
(d) plaster of paris

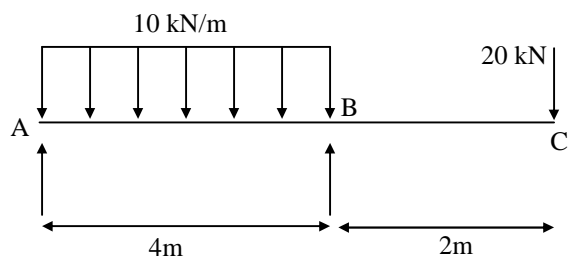
2 Mark Questions

17. Figure shown a single degree of freedom. The system consists of massless rigid bar. OP hinged at 'O' and a mass 'm' at end 'P'. The natural frequency of vibration of the system



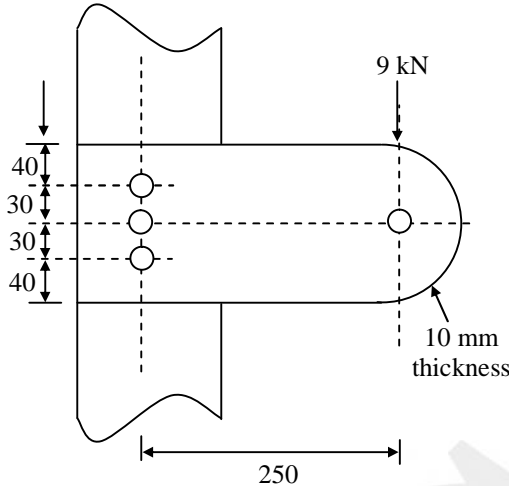
- (a) $f_n = \frac{1}{2\pi} \sqrt{\frac{k}{4m}}$ (b) $f_n = \frac{1}{2\pi} \sqrt{\frac{k}{2m}}$
(c) $f_n = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$ (d) $f_n = \frac{1}{2\pi} \sqrt{\frac{2k}{m}}$

18. For overhanging beam shown in figure, the magnitude of maximum bending moment (in kN-m) is _____





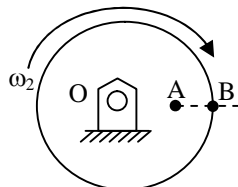
19. A cantilever bracket is bolted to column using three M12 × 1.75 bolts P, Q, R. The value of maximum shear stress developed in the bolt P (in MPa) is _____



20. Air in room is at 35°C and 60% relative humidity (R.H). The pressure in room is 0.1 MPa. The saturated pressure of water at 35°C is 5.63 kPa. The humidity ratio of the air (in gram/kg of dry water) is _____.
21. Ratio of solidification time of a cylindrical casting (height = radius) to the cubic casting of side two times the height of cylinder casting is _____
22. The dimensions of a cylindrical side riser (height = diameter) for a 25 cm × 15cm × 5cm steel casting are to be determined. For the tabulated shape factor values given below the diameter of the riser (in cm) is _____

| Shape factor | 2 | 4 | 6 | 8 | 10 | 12 |
|-----------------------------|-----|------|------|------|------|------|
| Riser volume/casting volume | 1.0 | 0.70 | 0.55 | 0.50 | 0.40 | 0.35 |

23. Figure shows a wheel rotating about O. Two points A and B located along the radius of wheel with speeds 80 m/s and 140 m/s respectively. The distance between the point A and B is 300 mm. The diameter of the wheel (in mm) is _____



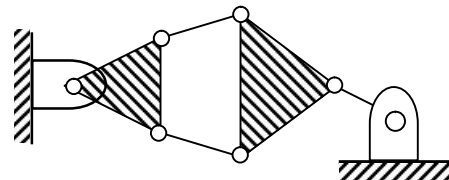
24. A Prandtl tube (pitot-static tube with C=1) is used to measure the velocity of water. The differential manometer reading is 10 mm of liquid column with a relative density of 10. Assuming $g = 9.8 \text{ m/s}^2$ the velocity of water (in m/s) is _____
25. Newon-Raphson method is used to find the roots of equation , $x^2 + 2x^2 + 3x - 1 = 0$. If the initial guess is $x_0 = 1$, then the value of x after 2nd iteration is _____
26. Which of the following are true, when cavitation parameter $\sigma = 0$?
- Local pressure is reduced to vapour pressure
 - Cavitation starts
 - Boiling of liquid starts
 - Cavitation stops

- (a) i, ii, iv (b) ii and iii
(c) i and iii (d) I, ii, iii

27. The value of $\int_C [(3x - 8y^2)dx + (4y - 6xy)dy]$, where C is boundary of the region bounded by $x=0$, $y=0$ and $x+y=1$ is _____

28. In a rolling operation using rolls of diameter 500 mm if a 25 mm thick plate cannot be reduced to less than 20 mm in one pass, the coefficient of friction between the roll and the plate is _____

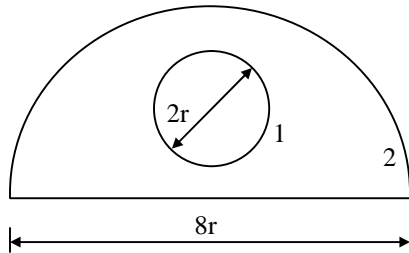
29. The number of DOF of the linkage shown in the figure is



- (a) -3 (b) 0 (c) 1 (d) 2



30. A solid sphere, of radius r is placed inside a hollow, closed hemispherical surface 2 of radius $4r$. The shape factor F_{2-1} is



- (a) $1/12$ (b) $1/2$ (c) 2 (d) 12

31. One side of a wall at 400 K and the other at 300 K. The rate of heat transfer through the wall is 1000W and surrounding temperature is 25°C . Assuming no heat generation of heat within the wall, the irreversibility (in W) associate due to heat transfer through the wall is _____

32. Inverse of $P = \begin{bmatrix} 4+3i & -i \\ i & 4-3i \end{bmatrix}$, $i = \sqrt{-1}$ then

P^{-1} is

- (a) $\frac{1}{24} \begin{bmatrix} 4-3i & i \\ -i & 4+3i \end{bmatrix}$ (b) $\frac{1}{24} \begin{bmatrix} 4+3i & i \\ -i & 4-3i \end{bmatrix}$
 (c) $\frac{1}{25} \begin{bmatrix} 4-3i & i \\ -i & 4+3i \end{bmatrix}$ (d) $\frac{1}{25} \begin{bmatrix} 4+3i & i \\ -i & 4-3i \end{bmatrix}$

35. Orthogonal turning of mild steel tube with a tool of rake angle is 10° is carried out at a feed of 0.14 mm/rev. if the thickness of the chip produce is 0.28 mm. The value of shear angle and shear strain will be respectively

- (a) $28^\circ 20'$ & 2.19 (b) $22^\circ 20'$ & 3.53
 (c) $24^\circ 30'$ & 4.19 (d) $37^\circ 20'$ & 5.19

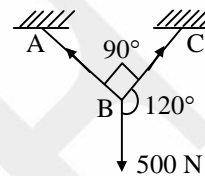
36. In the pipe flow between two points P and Q three pipes are connected parallel then which of the following statements are correct.

- (a) $h_L = h_{L1} = h_{L2} = h_{L3}$; $Q = Q_1 = Q_2 = Q_3$
 (b) $h_L = h_{L1} = h_{L2} = h_{L3}$; $Q = Q_1 + Q_2 + Q_3$
 (c) $h_L = h_{L1} + h_{L2} + h_{L3}$; $Q = Q_1 + Q_2 + Q_3$
 (d) $h_L = h_{L1} + h_{L2} + h_{L3}$; $Q = Q_1 = Q_2 = Q_3$

37. Of these following figure given below the mass moment of Inertia is maximum for _____

- (a) solid cylinder (b) flywheel
 (c) Sphere (d) Cube

38.



The tension in the cable AB _____ (N).

39. $T = 10000 + 2\sin\theta - 4\cos 2\theta$ is the resisting torque of two stroke engine rotating at 100 rpm. The power developed in kW is _____

40. For unit step size $\int_1^2 x \ln x dx$ by using trapezoidal rule the value of Integral _____

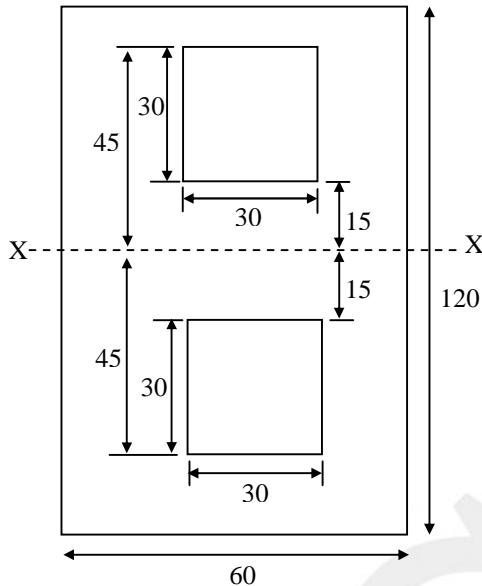
41. An ideal gas mixture contains

| | | |
|-------|-------|--------|
| N_2 | O_2 | CO_2 |
| 60% | 30% | 10% |

On basis and universal gas constant is 8314 kJ/kmoleK. Then the resultant mixture of ideal gas has a gas constant _____



42. The moment of inertia of the following about X-X axis (in mm^4) is



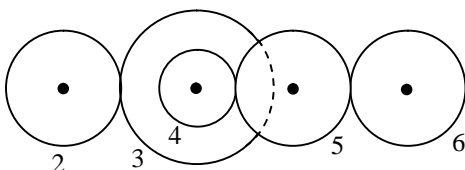
- (a) 8.55×10^6 (b) 7.06×10^6

43. In simple vapour compression cycle the refrigerant vapour enters the compressor inlet at 202 kJ/kg and at exit is 287 kJ/kg and at the exit of condenser is 47kJ/kg. The COP of cycle is _____

44. Steam flows through the turbine at an inlet enthalpy of ($h=2339$ kJ/kg.K, $u =$). Heat loss from the turbine is 50 kJ/kg and the exit enthalpy of ($h_2 = 1239$ kJ/kg) the power output of turbine is _____

45. A room is maintained at a temperature of 27°C and the ambient is at -5°C the thickness of wall is 0.18 m and thermal conductivity of wall is 0.9 W/m.K and the outside heat transfer coefficient is 20 W/m²K. The heat loss per surface area is _____

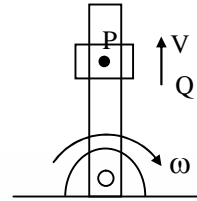
46.



From the above figure which are the idler gears

- (a) 4, 6 (b) 3,5 (c) 4,5 (d) 4,2

47. A link is rotating clockwise at an angular velocity ' ω ' is moving outward at a velocity ' v ' (the point P is on slider) and Q is on link. Then the Coriolis acceleration is



- (a) $2v\omega$ in the direction of ω & perpendicular to velocity of slider
 (b) $2v\omega$ in the opposite direction of ω and perpendicular to velocity of slider
 (c) _____
 (d) _____

48. The ball bearing is subjected to a radial load and the relation for load and life in million revolution is given by $F(L)^{1/3}=k$. If radial load of 2 kN is acting at 460 million revolution then the load of 1 million revolutions _____

49. Maximize $Z = 3x_1 + 2x_2$

Subjected to

$$-2x_1 + 3x_2 \leq 9$$

$$x_1 - 5x_2 \geq -20$$

$$x_1, x_2 \geq 0$$

- (a) unbounded (b) infeasible
 (c) degenerate
 (d) may have other optimal solution

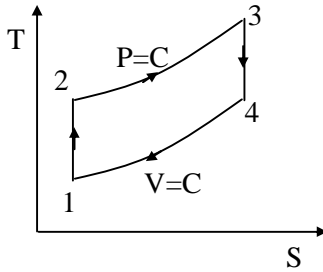
50. $P(x) = 1/4$; $P(y) = 1/3$; $P(x \cap y) = 1/2$. then $P(y/x) = ?$

51. A circular arc is drawn from point (20,20) to (10,10) with centre (20,10) with increment positioning system the correct representation of codes

- (a) N05 G91 G02 X-10 Y-10
 (b) N05 G91 G03 X-10 Y-10
 (c) N05 G90 G02 X-5 Y-5
 (d) N05 G90 G03 X-5 Y-5

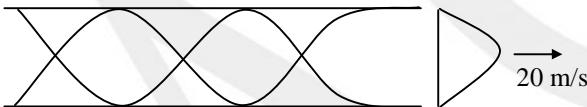


52. In a diesel cycle as shown in T-s diagram the efficiency is given by

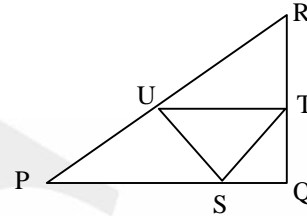


- (a) $\eta = 1 - \frac{\gamma(T_4 - T_1)}{T_3 - T_2}$
 (b) $\eta = 1 - \frac{1}{\gamma} \frac{(T_4 - T_1)}{T_3 - T_2}$
 (c) $\eta = 1 - \frac{(T_4 - T_1)}{T_3 - T_2}$
 (d) $\eta = 1 - \frac{(T_3 - T_2)}{T_4 - T_1}$

53. A gun barrel made of two helical slots and bullet rotates while moving, given that bullet makes 1 rotation in 0.15m. if bullet is ejected at a velocity of 20 m/s, what is the angular velocity of bullet in rad/sec _____



54. For a given below figure. PS:QS = 3:1, RT:QT = 5:2, PU:UR = 1:1. If the area of QTS triangle is 10 cm², then the area of PQR (in cm²) is _____ .



55. Consider the statements given
 Statement 1: No manager is leader
 Statement 2: All leader are executives
Conclusion
 (I) No manager is an executive
 (II) No executive is a manager
- (a) Conclusion I follows
 (b) Conclusion II follows
 (c) Conclusion I & II follow
 (d) Neither Conclusion I nor Conclusion II follows

NOTE: We don't claim the questions to be exact as given in GATE – 2015. The questions are based on memory of the students who appeared for the GATE – 2015 Exam.

***** Key will be uploaded very soon...**