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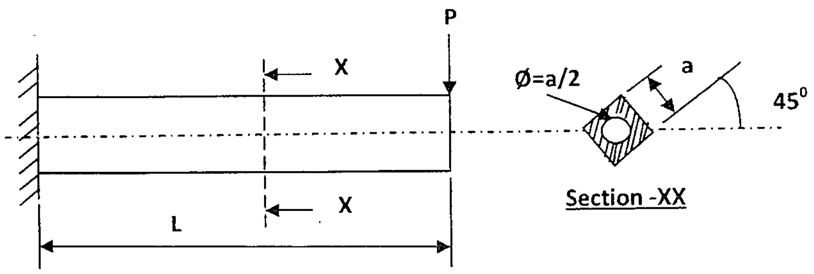
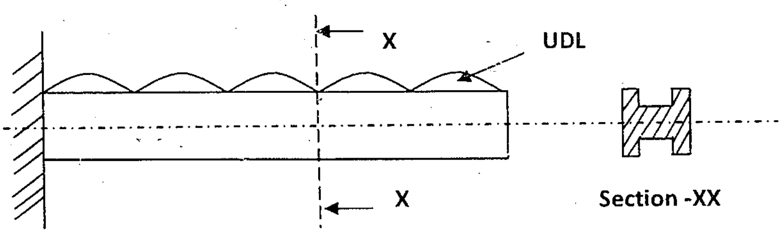
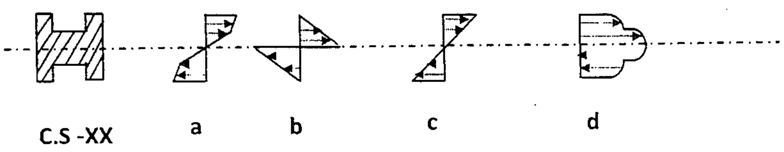
**1** A concentrated load P is applied at the end of a cantilever as shown in Fig. The cross section of the beam is a square of side 'a' with a hole of dia 'a/2'. The deflection at the tip of the cantilever is given by




| (a) | (b) | (c) | (d) |
|---|---|---|---|
| $\frac{3P}{E}\,\frac{L^3}{a^4}$ | $\frac{1024\,P}{(256-3\pi)E}\,\frac{L^3}{a^4}$ | $\frac{1024P}{(256-\frac{\pi}{64})E}\,\frac{L^3}{a^4}$ | $\frac{256\,P}{(1024-3\pi)E}\,\frac{L^3}{a^4}$ |

**2** A cantilever beam is subjected to a UDL. The cross section of the beam is a H-Section placed as shown in Fig. The bending stress distribution across the cross section will be




**3** A thick cylinder of inner dia 'D', wall thickness $t_2$ and length 'L' is sealed at its both ends with caps. The thickness of the cap is $t_1$. Allowable tensile yield stress = $\sigma_y$ and allowable shear stress = $\tau_y$. A gas is pumped into this cylinder at pressure 'p'. The cap will yield in shear at circumference of diameter 'D' when the gas pressure applied is more than



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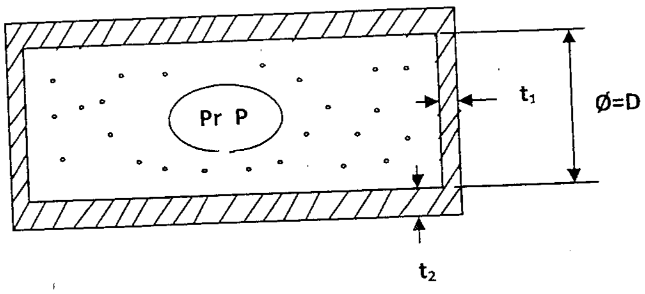
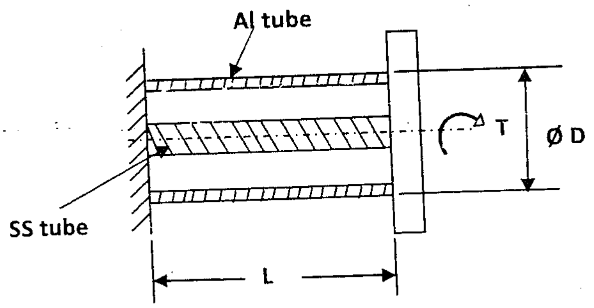



| (a) | (b) | (c) | (d) |
|---|---|---|---|
| $\frac{4t_1\tau_y}{D}$ | $\frac{8t_1\tau_y}{D}$ | $\frac{4t_2\,\sigma_y}{D}$ | $\frac{2t_1\tau_y}{D}$ |

4 An 'SS' tube is inserted into an 'Al' tube. They are permanently fixed at one end. The other end is attached to a rigid plate. A torque 'T' is applied to the rigid plate. The circumference of the 'Al' tube at dia 'D' at the plate end with respect to the fixed end rotates by a distance ................mm due to torque 'T'. The polar MOI & Rigidity modulus of Al & SS are $J_{Al}$ , $G_{Al}$ and $J_{ss}$ , $G_{ss}$ respectively.




| (a) | (b) | (c) | (d) |
|---|---|---|---|
| $\frac{DLT}{2(G_{Al}J_{Al} - G_{SS}J_{SS})}$ | $\frac{DLT}{2G_{Al}J_{Al}}$ | $\frac{DLT}{2(G_{Al}J_{Al} + G_{SS}J_{SS})}$ | $\frac{2\,DLT}{G_{SS}J_{SS}}$ |



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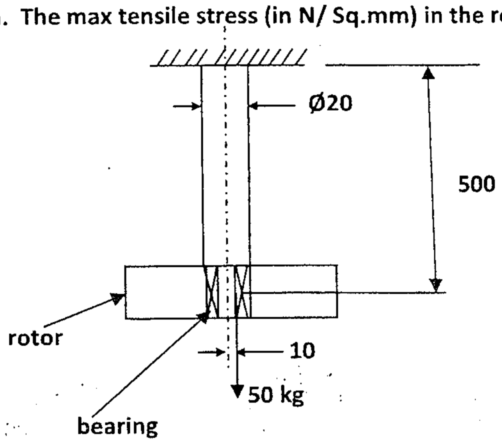
| | |
|---|---|
| 5 | A rod of 20 dia is fixed to the ceiling of a roof on one end. A rotor of 50 kg mass is attached to the free end with bearings. The CG of the rotor is 10 mm away from the shaft axis. The rotor is rotating at 600 rpm. The max tensile stress (in N/ Sq.mm) in the rod is nearly equal to   |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| | $\pi / 2$ | $200\,\pi$ | $300\,\pi$ | $400\,\pi$ |

| | |
|---|---|
| 6 | An automotive engine having a mass of 135 kg is supported on 4 springs with linear characteristics. Each of the 2 front springs have stiffness of 3 MN/m while the stiffness of each of 2 rear springs is 4.5 MN/m. The engine speed (rpm) at which resonance is likely to occur is |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| | $10^3/(6\pi)$ | $1/(6\pi)$ | $10^4/(\pi)$ | $10^3/(3)$ |

| | |
|---|---|
| 7 | A weighing m/c consists of a 2 kg pan resting on a spring having linear characteristics. In this condition of resting on the spring, the length of spring is 200mm. When a 20 kg mass is placed on the pan, the length of the spring becomes 100mm. The undeformed length L in mm and the spring stiffness K in N/m are |

| | | |
|---|---|---|
| | a) L = 220 & K=1862 | (b) L = 200, K = 1960 |
| | (c) L = 210, K = 1960 | (d) L = 200, K = 2 |

| | |
|---|---|
| 8 | A circular shaft is subjected to a torque 'T' and a Bending Moment M. The ratio of max. shear stress to max. bending stress is |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| | 2M/T | T/2M | 2T/M | M/2T |



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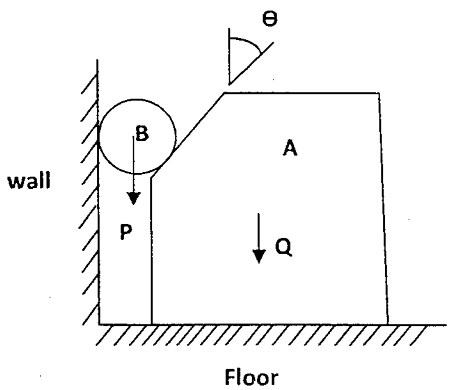
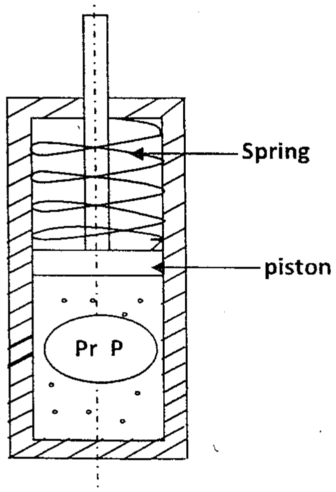
9 A solid block 'A' weighing 'Q' kg is resting on a flat floor. A smooth cylinder 'B' weighing 'P' kg. is placed between the solid A and the vertical wall as shown in fig. The friction between the cylinder, wall and the block A is negligible. The co-efficient of friction between the block A and floor is μ. The minimum weight P required to disturb the block A is




| (a) | (b) | (c) | (d) |
|---|---|---|---|
| $\frac{Q(1-Tan\,\theta)}{\mu\ Tan\theta}$ | $\frac{\mu Q\ Tan\theta}{(1-\mu\,Tan\,\theta)}$ | $\mu Q\ Cos\theta$ | $\frac{\mu Q}{Cos\theta}$ |

10 A hydraulic jack is used to compress a spring as shown in fig. Stiffness of spring is $10^5$ N/m. By applying a pressure 'p' in the hydraulic cylinder, the spring gets compressed by 10mm. The cross sectional area of the piston is 25 $cm^2$. The applied pressure 'p is



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| | | | | |
|---|---|---|---|---|
| | | | | |
| | (a) 4 x $10^5$ Pascals | (b) 40 Pascals | (c) 250 Pascals | (d) 25 Pascals |
| 11 | A small plastic boat loaded with pieces of steel rods is floating in a bath tub. If the cargo is dumped into the water, allowing the boat to float empty, the water level in the tub will | | | |
| | (a) Rise | (b) Fall | (c) Remains the same | (d) Rise and then fall |
| 12 | Viscosity of water in comparison to mercury is | | | |
| | (a) higher | (b) lower | (c) same | (d) unpredictable |
| 13 | Froude number is significant in: | | | |
| | (a) Supersonics, as with projectile and jet propulsion | | | |
| | (b) Full immersion or completely enclosed flow, as with pipes, air crafts wings, nozzles, etc. | | | |
| | (c) Simultaneous motion through two fluids where there is a surface discontinuity, gravity forces and wave making effect, as with ship's hulls | | | |
| | (d) All of these | | | |
| 14 | The purpose of surge tank in a pipe line is to | | | |
| | (a) smoothen the flow of water | (b) minimize friction losses in pipe | | |
| | (c) prevent occurrence of hydraulic jump | (d) relieve pressure due to water hammer | | |
| 15. | Head loss in turbulent flow in a pipe | | | |
| | (a) varies directly as velocity | (b) varies inversely as square of velocity | | |
| | (c) varies approximately as square of velocity | (d) varies inversely as velocity | | |
| 16. | A tank 1.5m stands on a trolly and is full of water. It has an orifice of diameter 0.1m at 0.3m from the bottom of the tank. If the orifice is suddenly opened and coefficient of discharge of the orifice is 0.60, then the propelling force on the trolley will be | | | |
| | (a) 69.37 N | (b) 67.39 N | (c) 63.79 N | (d) 65.39 N |
| 17. | A model of a hydraulic turbine is tested at a head of 1/4$^{th}$ of that under which the full scale turbine works. The diameter of the model is half of that of the full scale turbine. If N is the RPM of the full scale turbine, then RPM of the model will be | | | |
| | (a) N/4 | (b) N/2 | (c) N | (d) 2N |
| 18 | Consider steady, incompressible and irrotational flow through a reducer in a horizontal pipe, where the diameter is reduced from 20 cm to 10 cm. The pressure in the 20 cm pipe just upstream of the reducer is 150 kPa. The fluid has a vapour pressure of 50 kPa and a specific weight of 5 kN/$m^3$. Neglecting frictional effects, the maximum discharge (in $m^3$/sec) that can pass through the reducer without causing cavitations is | | | |



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| | | | | |
|---|---|---|---|---|
| | (a) 0.05 | (b) 0.16 | (c) 0.27 | (d) 0.38 |

19 For the stability of a floating body, under the influence of gravity alone, which of the following is true?

- (a) Metacentre should be below the centre of gravity
- (b) Metacentre should be above the centre of gravity
- (c) Metacentre and centre of gravity must lie on the same horizontal line
- (d) Metacentre and centre of gravity must lie on the same vertical line

20 A smooth pipe of diameter 200mm carries water. The pressure in the pipe at Section S1 (elevation: 10m) is 50 kPa . At section S2 (elevation: 12 m ) the pressure is 20 kPa and velocity is 2 m/sec . Density of water is 1000 kg/ $m^3$ and acceleration due to gravity is 9.8 m/ $sec^2$ . Which of the following is true?

| | |
|---|---|
| (a) Flow is from S1 to S2 and head loss is 0.53m | (b) Flow is from S2 to S1, and head loss is 0.53m |
| (c) Flow is from S1 to S2 and head loss is 1.06m | (d) Flow is from S2 to S1 and head loss is 1.06m |

21. The 2-D flow with velocity $\overline{v} = (x + 2y + 2)\,i + (4 - y)\,j$ is

| | |
|---|---|
| (a) compressible and irrotational | (b) compressible and not irrotational |
| (c) incompressible and irrotational | (d) incompressible and not irrotational |

22. A venturimeter of 20mm throat diameter is used to measure the velocity of water in a horizontal pipe of 40mm diameter. If the pressure difference between the pipe and throat sections is found to be 30 kPa, then, neglecting frictional losses, the flow velocity is

| | | | |
|---|---|---|---|
| (a) 0.2 m/sec | (b) 1.0 m/sec | (c) 1.4 m/sec | (d) 2.0 m/sec |

23 A room contains 60 kg of air at 100 kPa and 15°C. The room has a 250-W refrigerator (the refrigerator consumes 250 W of electricity when running), a 120-W TV, a 1-kW electric resistance heater, and a 50-W fan. During a cold winter day, it is observed that the refrigerator, the TV, the fan, and the electric resistance heater are running continuously but the air temperature in the room remains constant. The rate of heat loss from the room that day is

| | | | |
|---|---|---|---|
| (a) 3312 kJ/h | (b) 4752 kJ/h | (c) 5112 kJ/h | (d) 2952 kJ/h |

24. Efficiency of Carnot engine is given as 80 %. If the cycle direction is reversed, what will be the value of COP of reversed Carnot cycle

| | | | |
|---|---|---|---|
| (a) 1.25 | (b) 0.5 | (c) 0.25 | (d) none of the above |



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| | |
|---|---|
| 25. | An adiabatic heat exchanger is used to heat cold water at 15°C entering at a rate of 5 kg/s by hot air at 90°C entering also at rate of 5 kg/s. If the exit temperature of hot air is 20°C, the exit temperature of cold water is |

| | | | | |
|---|---|---|---|---|
| | (a) 27°C | (b) 32°C | (c) 52°C | (d) 85°C |

| | |
|---|---|
| 26. | For given combined radiative and convective heat transfer coefficient '$h_t$' and given thermal conductivity k, Critical thickness of insulation for cylinder and sphere is given as |

| | | | | |
|---|---|---|---|---|
| | (a) $\frac{k}{h_t}$ and $\frac{k}{h_t^2}$ | (b) $\frac{k}{h_t}$ and $\frac{2k}{h_t}$ | (c) $\frac{2k}{h_t}$ and $\frac{k}{h_t^2}$ | (d) $\frac{2k}{h_t}$ and $\frac{k}{h_t}$ |

27. Match the following

| | |
|---|---|
| P:Compressible flow | U: Reynolds number |
| Q: Free surface flow | V: Nusselt number |
| R: Boundary layer flow | W: Weber number |
| S: Pipe flow | X: Froude number |
| T: Heat convection | Y: Mach number |
| | Z: Skin friction coefficient |

| | | |
|---|---|---|
| | (a) P-U; Q-X; R-V; S-Z; T-W | (b) P-W; Q-X; R-Z; S-U; T-V |
| | (c) P-Y; Q-W; R-Z; S-U; T-X | (d) P-Y; Q-W; R-Z; S-U; T-V |

| | |
|---|---|
| 28. | A spherical thermocouple junction of diameter 0.706 mm is to be used for the measurement of temperature of a gas stream. The convective heat transfer co-efficient on the bead surface is 400 $W/m^2K$. Thermo-physical properties of thermocouple material are k = 20 W/mK, C = 400 J/kg K and r = 8500 $kg/m^3$. If the thermocouple initially at 30°C is placed in a hot stream of 300°C, the time taken by the bead to reach 298°C, is |

| | | | | |
|---|---|---|---|---|
| | a) 2.35 s | b) 4.9 s | c) 14.7 s | d) 29.4 s |

| | |
|---|---|
| 29. | Two insulating materials of thermal conductivity K and 2K are available for lagging a pipe carrying a hot fluid. If the radial thickness of each material is the same. |
| | (a) material with higher thermal conductivity should be used for the inner layer and one with lower thermal conductivity for the outer. |
| | (b) material with lower thermal conductivity should be used for the inner layer and one with higher thermal conductivity for the outer. |
| | (c) it is immaterial in which sequence the insulating materials are used |
| | (d) it is not possible to judge unless numerical values of dimensions are given. |



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30. The definition of 1 K as per the internationally accepted temperature scale is

(a) 1/100th the difference between normal boiling point and normal freezing point of water.
(b) 1/273.15th the normal freezing point of water
(c) 100 times the difference between the triple point of water and the normal freezing point of water.
(d) 1/273.16th of the triple point of water.

31. For a perfect gas match list I with list II:

| List I | List II |
|---|---|
| (A) Isobaric thermal expansion coefficient | (1) 0 |
| (B) Isothermal compressibility | (2) $\infty$ |
| (C) Isentropic compressibility | (3) 1/v |
| (D) Joule – Thomson coefficient | (4) 1/T |
| | (5) 1/p |
| | (6) $1/\gamma p$ |

(a) A-4,B-3,C-2, D-1 (b) A-1,B-2,C-4, D-6 (c) A-4,B-5,C-6, D-1 (d) A-3,B-4,C-6, D-5

32. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for

(a) copper (b) steel (c) glass-wool (d) refractory brick

33. Select statements from List II matching the processes in List I. Enter your answer as A, B if the correct choice for (1) is (A) and that for (2) is (B)

| List I | List II |
|---|---|
| (A) Fourier number | (1) Surface tension |
| (B) Weber number | (2) Forced convection |
| (C) Grashoff number | (3) Natural convection |
| (D) Schmidt number | (4) Radiation |
| | (5) Transient heat conduction |
| | (6) Mass diffusion |

(a) A-2, B-1, C-3, D-5 (b) A-5, B-1, C-3, D-6 (c) A-5, B-2, C-3, D-1 (d) A-5, B-1, C-3, D-4

34 In a radiative heat transfer, a gray surface is one

(a) which appears gray to the eye
(b) whose emissivity is independent of wavelength
(c) which has reflectivity equal to zero
(d) which appears equally bright from all directions



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| | | | | |
|---|---|---|---|---|
| 35. | A system undergoes a state change from 1 to 2. According the second law of thermodynamics for the process to be feasible, the entropy change, S2 – S1 of the system | | | |
| | (a) is positive or zero | (b) is negative or zero | | |
| | (c) is zero | (d) can be positive, negative or zero | | |
| 36. | In descending order of magnitude, the thermal conductivity of (a) pure iron, (b) liquid water, (c) saturated water vapour and (d) aluminum can be arranged as | | | |
| | (a) a b c d | (b) b c a d | (c) d a b c | (d) d c b a |
| 37. | For the same inlet and outlet temperatures of hot and cold fluids, the Log Mean Temperature Difference (LMTD) is | | | |
| | (a) greater for parallel flow heat exchanger than for counter flow heat exchanger. | | | |
| | (b) greater for counter flow heat exchanger than for parallel flow heat exchanger. | | | |
| | (c) same for both parallel and counter flow heat exchangers. | | | |
| | (d) dependent on the properties of the fluids. | | | |
| 38. | A positive value of Joule-Thomson coefficient of a fluid means | | | |
| | (a) temperature drops during throttling | (b) temperature remains constant during throttling | | |
| | (c) temperature rises during throttling | (d) none of these | | |
| 39. | A Carnot engine rejects 30% of absorbed heat to a sink at 30°C. The temperature of the heat source is | | | |
| | (a) 100 °C | (b) 433 °C | (c) 737 °C | (d) 1010 °C |
| 40. | An engine operates between temperature limits of 900 K and T and T and 400 K. For both to be equally efficient, the values of T will be | | | |
| | (a) 700 K | (b) 600 K | (c) 750 K | (d) 650 K |
| 41 | In a heat exchanger, the hot liquid enters with a temperature of 180°C and leaves at 160°C. The cooling fluid enters at 30°C and leaves at 110°C. The capacity ratio of the heat exchanger is | | | |
| | (a) 0.25 | (b) 0.40 | (c) 0.50 | (d) 0.55 |



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| | | |
|---|---|---|
| 42 | A system of masses rotating in different parallel planes is in dynamic balance if – | |
| | (a) Resultant force is zero | (b) resultant couple is zero |
| | (c) resultant force is numerically equal to resultant couple | (d) resultant force and the resultant couple, both are equal to zero. |
| 43 | A torsion bar with a spring constant 'k' is cut into 'n' equal lengths. The spring constant for each portion would be | |
| | (a) nk | (b) $k^n$ |
| | (c) k/n | (d) $k^{1/n}$ |
| 44 | Logarithmic decrement of a damped single degree of freedom system is δ. If stiffness of the spring is doubled and mass is made half, then logarithmic decrement of the new system will be equal to | |
| | (a) 1/2δ | (b) δ |
| | (c) 2δ | (d) ¼ δ |
| 45 | To ensure self locking in a screw jack it is essential that helix angle is | |
| | (a) larger than friction angle | (b) smaller than friction angle |
| | (c) equal to friction angle | (d) such as to give maximum efficiency in lifting |

| | | | | |
|---|---|---|---|---|
| 46 | For a particular load distribution and support condition in a beam of length 'L', bending moment at any section 'x' (O < x <L) is given by $M(x) = Ax-Bx^2$, where A and B are constants. The shear force in the beam will be zero at 'x' equal to | | | |
| | (a) A/2B | (b) A/B | (c) 2A/B | (d) $A^2/B$ |
| 47 | If A is $\begin{bmatrix} 8 & 5 \\ 7 & 6 \end{bmatrix}$ then $\lvert A^{121} - A^{120} \rvert$ is | | | |
| | (a) 0 | (b) 1 | (c) 120 | (d) 121 |

| | | |
|---|---|---|
| 48 | If A is Square Matrix of order 3, then product of A and its transpose is | |
| | (a) Unit Matrix | (b) Zero Matrix |
| | (c) Identity Matrix | (d) Symmetric Matrix |
| 49 | The Matrix A= $\begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -5 \\ -1 & 5 & 0 \end{bmatrix}$ is | |



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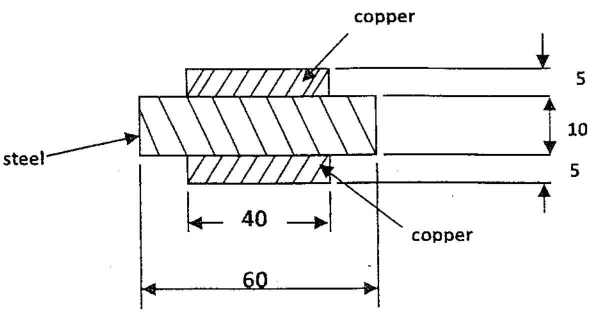
| | | | | |
|---|---|---|---|---|
| | (a) Orthogonal Matrix | | (b) Skew Symmetric | |
| | (c) Symmetric | | (d) Idempotent | |
| 50 | Vector a= 3i + 2j – 6k, vector b= 4i – 3j + k, angle between above vectors is | | | |
| | (a) $90^\circ$ | (b) $0^\circ$ | (c) $45^\circ$ | (d) $60^\circ$ |
| 51 | If the probability for A to fail an examination is 0.2 and that for B is 0.3, then probability that either A of B fail is | | | |
| | (a) 0.5 | (b) 0.06 | (c) 0.44 | (d) 0.1 |
| 52 | Area bounded by the parabola $2y= x^2$ and the line x = y-4 is equal to | | | |
| | (a) 4.5 | (b) 9 | (c) 18 | (d) 36 |
| 53 | Chance that a leap year selected at random will contain 53 Sundays is | | | |
| | (a) 3/7 | (b) 7/2 | (c) 7/3 | (d) 2/7 |
| 54 | $\lim_{x \to 0} \frac{x^2 + x - \sin x}{x^2}$ | | | |
| | (a) 0 | (b) $\infty$ | (c) 1 | (d) None of these |
| 55 | Two objects P & Q are traveling horizontally with velocity of 8 m/sec & 6 m/sec from left to right. They are separated by a distance of 15 m. The mass of the objects are 3 kg and 5 kg. If the coefficient of restitution is 0.7 what is the velocity (m/s) of P and Q after impact and when (seconds) and where (metres) will they impact with respect to initial positioning of Q. The corresponding answers are respectively | | | |
| | a) 7.6, 5.4, 2.1, 15 | b) 8, 6, 2.5, 7.5 | c) 7.6, 6.2, 7.5 , 45 | d) None of these |
| 56 | The cross section of a compound bar 1 m long is as shown in figure. If the temperature is raised by $80^\circ$ C determine the stresses (in $N/mm^2$ ) in each metal   | | | |



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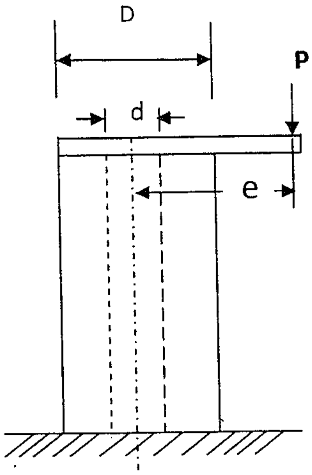
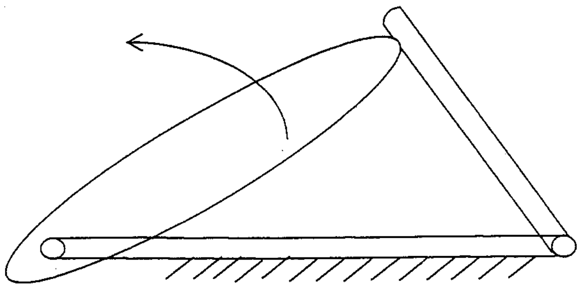
| | | |
|---|---|---|
| | $E_{ss} = 2 \times 10^5$ N/ mm$^2$, $E_c = 1 \times 10^5$ N/ mm$^2$, $A_{ss} = 600$ mm$^2$, $A_c = 200$ mm$^2$ | |
| | a) $\sigma_c = 20$ (Compressive), $\sigma_{ss} = 30$ (Tensile) | b) $\sigma_c = 30$ (Compressive), $\sigma_{ss} = 20$ (Tensile) |
| | c) $\sigma_c = 30$ (Tensile), $\sigma_{ss} = 20$ (Compressive) | d) $\sigma_c = 30$ (Tensile), $\sigma_{ss} = 20$ (Tensile) |

57 A short column of external diameter D and internal diameter d is subjected to a compressive load P acting with an eccentricity 'e'. If the stresses at one of the extreme fibre is zero then the eccentricity has to be




| | | | |
|---|---|---|---|
| (a) $\frac{D^2 + d^2}{8\pi D}$ | b) $\frac{D^2 + d^2}{8D}$ | c) $\frac{D^2 - d^2}{8D}$ | d) $\frac{D^3 - d^3}{8D^2}$ |

58 The number of degrees of freedom in the 3 link mechanism shown below is given by





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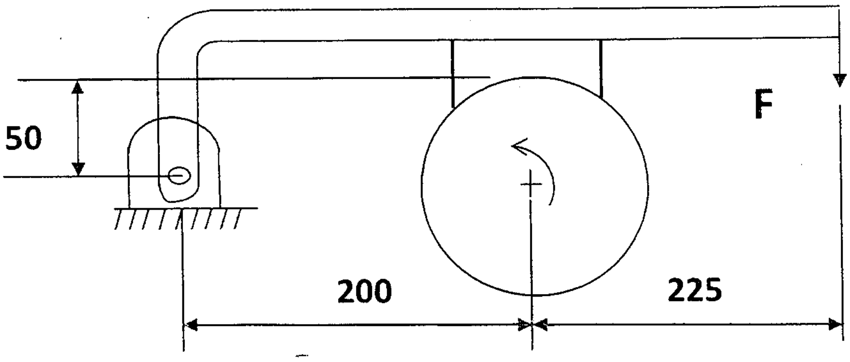
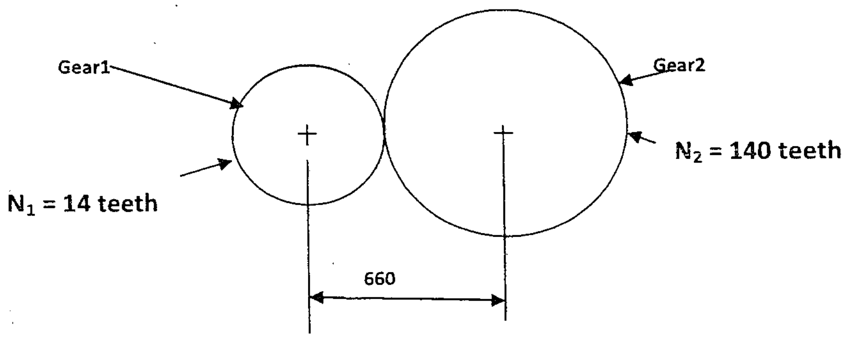
| | | | | |
|---|---|---|---|---|
| | (a) 1 | (b) 2 | (c) 3 | (d) 0 |
| 59 | The equation of motion for a damped vibration is given by $6\ddot{x} + 9\dot{x} + 27x = 0$. The damping factor will be | | | |
| | (a) 0.25 | (b) 0.5 | (c) 0.35 | (d) 0.75 |
| 60 | A block brake with 400 mm diameter is used to brake a torque of 100 Nm as shown in the figure. If the coefficient friction is 0.25 at the brake surface what is the value of force F to be applied at the end of the lever.   | | | |
| | (a) 559.4 N | (b) 579.4 N | (c) 439.4 N | (d) 1000 N |
| 61 | In the gear train of 1:10 as shown in the figure the pinion transmits 250 kw at 1800 rpm. What is the tangential load on the gear tooth   | | | |
| | (a) 221 kN | (b) 22.1 kN | (c) 25.1 kN | (d) 251 kN |



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| | | | | |
|---|---|---|---|---|
| 62 | Spring back in metal forming depends on | | | |
| | (a) Modulus of Elasticity | | (b) Load Applied | |
| | (c) Strain Rate | | (d) None of these | |
| 63 | Which of the following processes induce more stress in the metal ? | | | |
| | (a) Hot rolling | (b) Forging | (c) Swaging | (d) Turning |
| 64 | The essential ingredient of any hardened steel is | | | |
| | (a) Austenite | (b) Pearlite | (c) Martensite | (d) Cementite |
| 65 | Following is a process used to form powder metal to shape | | | |
| | (a) Sintering | (b) Explosive Compacting | (c) Isostatic Molding | (d) All of these |
| 66 | A titanium sheet of 5.0 mm thickness is cut by wire-cut EDM process using a wire of 1.0 mm diameter. A uniform spark gap of 0.5 mm on both sides of the wire is maintained during cutting operation. If the feed rate of the wire into the sheet is 20 mm/min, the material removal rate(in $mm^3$/min) will be | | | |
| | (a) 150 | (b) 200 | (c) 300 | (d) 400 |
| 67 | Diamond cutting tools are not recommended for machining of ferrous metals due to | | | |
| | (a) high tool hardness | (b) chemical affinity of tool material with iron | (c) Poor tool toughness | (d) High Thermal conductivity of work material |
| 68 | During the execution of a CNC part program block N020 G02 X45.0 Y25.0 R5.0 the type of tool motion will be | | | |
| | (a) circular Interpolation – clockwise | (b) Circular Interpolation – Counter clockwise | (c) Linear Interpolation | (d) Rapid Feed |
| 69 | Projection Welding is a | | | |
| | (a) Continuous Spot Welding Process | (b) multi-spot welding process | (c) Arc Welding Process | (d) Process used for joining round bars |
| 70 | In a single point turning operation with a cemented carbide and steel combination having a Taylor exponent of 0.25, if the cutting speed is halved, then tool life will become | | | |



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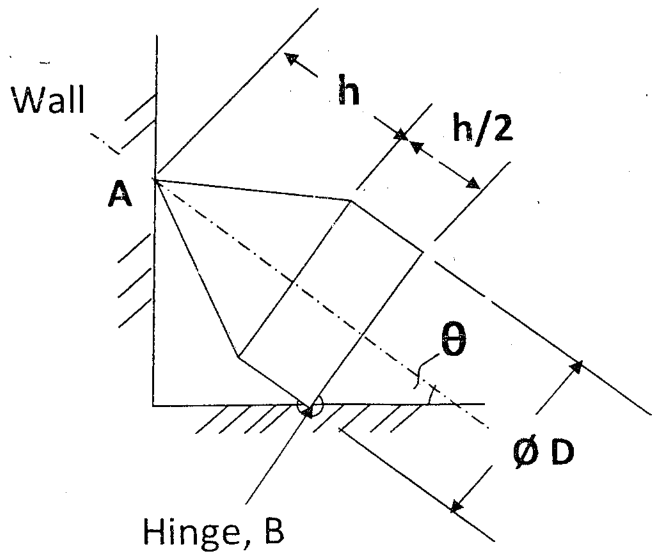
| | | | | |
|---|---|---|---|---|
| | (a) half | (b) sixteen times | (c) Two Times | (d) Eight times |
| 71 | An oxidising process used for aluminium and magnesium articles is called | | | |
| | (a) galvanising | (b) Anodising | (c) Parkerising | (d) Sheradising |
| 72. | One of the characteristics of Polymer is | | | |
| | (a) high Temperature Stability | (b) High Mechanical Strength | (c)High Elongation | (d) Low Hardness |
| 73 | Usually Materials with the following crystal structure fail in ductile mode | | | |
| | (a) FCC | (b) BCC | (c) HCP | (d) None of these |
| 74 | Work hardening strengthens an alloy by | | | |
| | (a) Removing Internal defects in the crystal structure | | (b) increasing the dislocation density | |
| | (c) Decreasing the grain size of the alloy | | (d) Increasing the lattice resistance to dislocation motion | |

75 An Aluminium object is made of a solid cone of height 'h' and base diameter D attached to a solid cylinder of diameter D and height 'h/2' as shown in figure. It is kept inclined touching to a vertical wall at point 'A' and hinged at point B on the floor. The object stays in this inclined position without going to vertical position (axis perpendicular to the floor), only if θ is less than




| | |
|---|---|
| a) $Tan^{-1}$ (10 D/9h) | b) $\pi/2 - Sin^{-1}$ (10 D/h) |
| c) $\pi/2 - Tan^{-1}$ (10 D/9h) | d) $Tan^{-1}$ (20 D/9h) |



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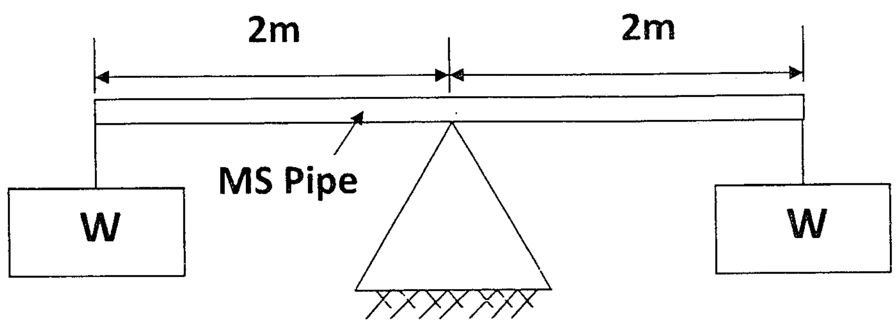
**76** A hollow MS pipe is kept on a smooth straight edge with the pipe mid point sitting on it. A load 'W' Newtons is applied at the ends which is keeping the pipe balanced in the horizontal condition. what is the safe maximum load 'W' that can be applied without yielding the tube. Consider the self weight of the tube as 'p' N/m.

Diameter of the pipe is 'd', Youngs modulus of pipe is E, Allowable yield stress is σ




| | |
|---|---|
| a) $(\sigma \pi d^4 - 64 p)/(64 E)$ | b) $(\sigma \pi d^4 - 32 p)/(32 E)$ |
| c) $(\sigma \pi d^3 + 64 p)/64$ | d) $(\sigma \pi d^3 - 64 p)/64$ |

**77** A car crashes against a wall. The initial velocity at collision is 15m/sec and the velocity after collision is 2.6m/sec <u>in the opposite direction</u>. The mass of the car is 1500kg. what is the <u>average</u> force exerted on the automobile bumper if collision lasts for 0.15 seconds.

| | | | |
|---|---|---|---|
| a) $1.76 \times 10^5$ N | b) $2.1 \times 10^5$ N | c) $2.76 \times 10^5$ N | d) None of these |

**78** Differential equation for the variation of amount of salt 'x' in a tank is given by :

(dx/dt ) + (x/20) = 10. where x is in kg and t is in minutes. Assuming that at time zero there is no salt in the tank, find the time at which the amount of salt increases to 100kg

| | | | |
|---|---|---|---|
| a) 100 ln 2 | b) 50 ln 2 | c) 20 ln 2 | d) 10 ln 2 |

**79** A 5 mm diameter aluminium alloy test bar is subjected to a load of 500 N. if the diameter of the bar at this load is 4 mm, the true strain is

| | | | |
|---|---|---|---|
| a) 0.56 | (b) 0.22 | c) 0.25 | (d) 0.45 |

**80** A material is dimensionally stable at room temperature if its glass transition temperature ($T_g$) is

| | | | |
|---|---|---|---|
| a) Below room temperature | (b) Just Above room temperature | ( c) Equal to room temperature | (d) Well above room temperature |



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