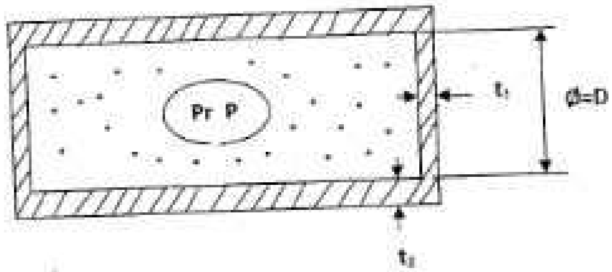
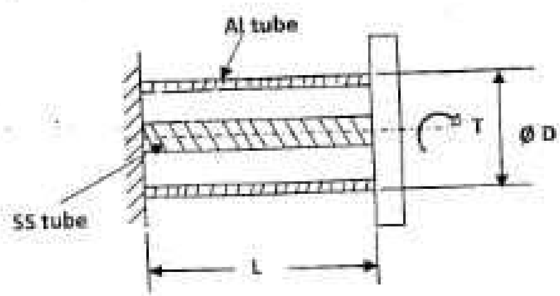


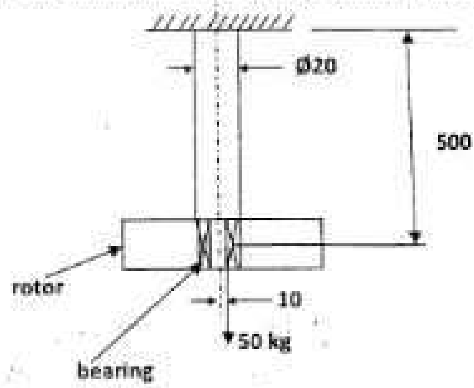
(a)	(b)	(c)	(d)
$\frac{4t_1\tau_y}{D}$	$\frac{8t_1\tau_y}{D}$	$\frac{4t_2\,\sigma_y}{D}$	$\frac{2t_1\tau_y}{D}$

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)
$\frac{DLT}{2(G_{Al}J_{Al} - G_{SS}J_{SS})}$	$\frac{DLT}{2G_{Al}J_{Al}}$	$\frac{DLT}{2(G_{Al}J_{Al} + G_{SS}J_{SS})}$	$\frac{2\,DLT}{G_{SS}J_{SS}}$

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

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

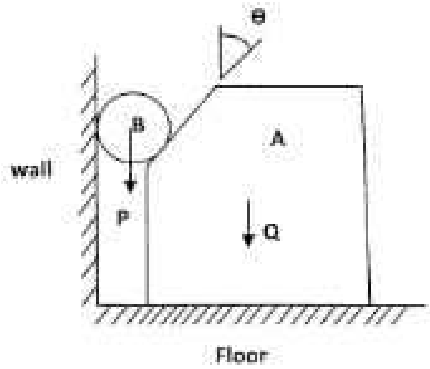
7 A weighing m/c consists of a 2 kg pan resting on a spring having linear characteristics. In this condition of resting on the spring, the length of spring is 200mm. When a 20 kg mass is placed on the pan, the length of the spring becomes 100mm. The undeformed length L in mm and the spring stiffness 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) 2M/T	(b) T/2M	(c) 2T/M	(d) M/2T

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