Q. Code: 724496

Reg. No. | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019

Third Semester

ME18304 – MECHANICS OF SOLIDS

(Mechanical Engineering)

(Regulation 2018)

Time: Three Hours **Maximum : 100 Marks**

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

		CO	RBT
1.	What is compound bar?	1	U
2.	When is the material said to be perfectly elastic?	1	AP
3.	When will be the maximum bending moment for a beam will occur?	2	AP
4.	Explain why the overhanging beams have point of contraflexure?	2	AP
5.	Give the relation for maximum deflection of the beam, simply supported at its ends, carrying uniformly varying load with zero intensity at one end and W/unit length at the other end.	3	AN
6.	What is meant by conjugate beam?	3	U
7.	Give some applications of Open Coil Spring?	2	AP
8.	What are the two conditions to be satisfied in the design of a circular shaft?	2	AP
9.	Define Principal Stress?	4	U
10.	Distinguish between Longitudinal stress and Circumferential Stress.	4	AP

PART B - (5 X16 = 80 Marks)

11.	(a)	A solid circular rod diameter 40 mm and of length 1000 mm is placed inside a brass tube of 45 mm internal diameter and 60 mm outer diameter. The length of the tube is 1000 mm. A compressive load of 350 kN is applied to the compound bar. Determine the stresses in steel and brass tube, if Es = 200 GPa, Eb = 100 GPa. Determine also the deformation of the bass tube.	(16)	1	AP
		(OR)			
	(b)	A plate of Aluminium 24 mm wide, 6 mm thick is placed between two steel plates each 24 mm wide, 9 mm thick to form a composite bar 24 x 24 mm. These plates are fixed at the ends to 10°C. Find the stress in steel and aluminium plates if the temperature is raised to 50°C. Take Es = 200 kN/mm^2, Ea = 66.67 kN/mm^2, $\alpha s = 12 \times 10^{-6}/^{o}C$ and $\alpha a = 23 \times 10^{-6}/^{o}C$.	(16)	1	AP
12.	(a)	Draw the Shear force and Bending moment diagrams for the simply supported beam shown in Figure 12 a	(16)	2	AP

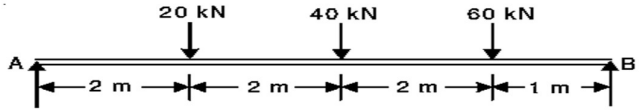

Figure 12a

(OR)

(b) Draw the Shear force and Bending moment diagrams for the loaded overhanging beam shown in Figure 12 b **(16) 2 AP**

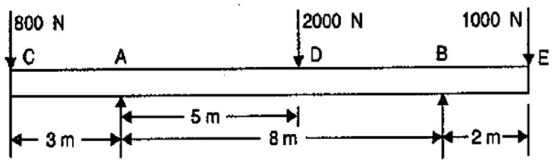

Figure 12 b

13. (a) Determine the deflection under each load for the given simply supported beam shown in Figure 13a, E =210GPa and I = 30000 cm^4 **(16) 3 AP**

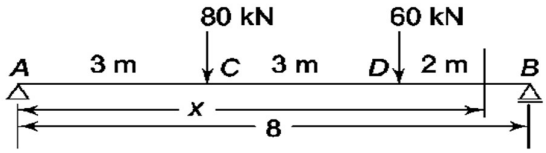

Figure 13a

(OR)

(b) A simply supported beam of length 5m is subjected to a load of 5 kN at a point 3 m from the left end. Calculate the slopes at the ends and the deflection at the point of application of load. EI is constant. **(16) 3 AP**

14. (a) A hollow shaft of diameter ratio 3/8 is to transmit 375 kW power at 100 rpm. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 60 N/mm^2 and twist in a length of 4 m not to exceed 2°. Calculate its external and internal diameter which should satisfy both the above conditions. Assume C =0.85 x 10^5 N/mm^2. **(16) 2 AP**

(OR)

(b) In a close coiled helical spring of round steel wire 10 mm in diameter having complete 10 turns with a mean diameter of 12 cm is subjected to a maximum load of 200 N. Determine the deflection, the maximum shear stress and the spring rate. Assume C =0.85 x 10^5 N/mm^2. **(16) 2 AP**

15. (a) A boiler shell is to be made of 15 mm thick plate having a limiting tensile stress of 120 MPa. If the efficiencies of the longitudinal and circumferential joints are 70% and 30% respectively determine: (i) The maximum permissible diameter of the shell for an internal pressure of 2 N/m^2, (ii) permissible intensity of the internal pressure when the shell diameter is 1.5 m. **(16) 4 AP**

(OR)

(b) The tensile stress at a point across two mutually perpendicular planes are 120N/mm^2 and 60N/mm^2. Determine the normal, tangential and resultant stress on the plane inclined at 30^0 to the axis of the minor stress. **(16) 4 AP**