MODEL QUESTION PAPER

Programme name: Mechanical Engineering Semester :3

Course code: 3021 **Course name: Strength of Materials**

Time : 3 Hours *Max.Marks : 75*

1. **Answer all the following questions (9 x 1 = 9 Marks)**

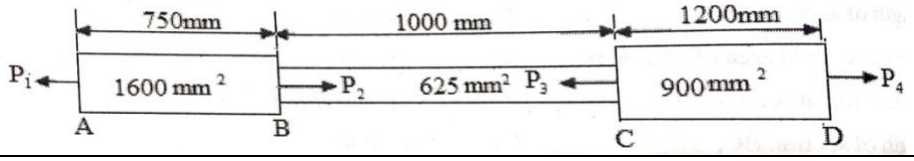
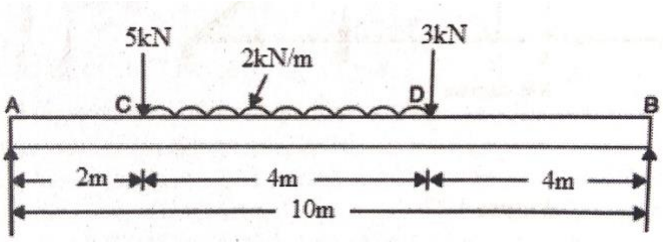
1	The ratio of the change in dimension of the body due to the deformation to its original dimension in the direction perpendicular to the force is called---------- - strain.	MO 1.01	R
2	The ratio of ultimate stress to the design stress is called ----------	MO 1.03	U
3	A load that is spread along the beam over the entire length or part of its length is called----------	MO 2.01	U
4	Point at which the bending moment is zero or changes sign from positive to negative or vice versa is called ------	MO 2.02	R
5	The layer between top and bottom layers of the beam which is unchanged in length due to bending is called -------	MO 3.01	R
6	The lateral displacement of a beam under the load is termed as ---------	MO 3.04	U
7	Failure along longitudinal section is due to ------ stresses set up in the walls of the cylinder.	MO 4.03	R
8	--------- is the ratio of the mean coil diameter to the diameter of the spring wire.	MO 4.02	R
9	Torsional section modulus is defined as the ratio of the -------- to the radius of the shaft.	MO 4.01	U

2. **Answer any Eight questionsfrom the following 8 x 3= 24 Marks)**

1	Differentiate Lateral strain and Longitudinal strain. What is factor of safety?	MO 1.01	U
2	A load of 80 kN is to be raised with the help of a steel wire. Find the minimum diameter of the steel wire if the stress is not to exceed $100MN/m^2$.	MO 1.05	U
3	A steel rod 4m long and 20mm in diameter is subjected to an axial tensile force of 45 kN. Determine the change in length, diameter and volume of the rod. Take $E=2.1x10^5N/mm^2$ and poisons ratio 0.3	MO 1.05	U
4	A simply supported beam of length 7m carries a UDL of 3kN/m over entire span. Draw SFD and BMD.	MO 2.03	A
5	What are the assumption made in the Euler's theory of long column?	MO 3.05	U
6	What you mean by a beam? Describe about cantilever beam and simply supported beam?	MO 2.01	U
7	A wooden beam of 140mm wide and 240mm deep is supported at each end of span of 4 meter. Determine the load, that can be placed at its center, to cause the beam a deflection of 10mm. take $E=6X10^4N/mm^2$	MO 3.04	U

8	A steel rod 5m long and 40mm diameter is used as a column with one end fixed and other free. Determine the load by Euler's formula. Take E=200GPa.	MO3.05	U
9	A hollow shaft having an inside diameter 60% of its outer diameter and has to transmit 200kW at 80rpm. If the shear stress is not to exceed 60MPa, estimate the diameters of the shaft.	MO 4.01	A
10	Define stress in a thin cylinder shell subjected to an internal pressure?	MO 4.03	R

3. **Answer all questions from the following (6x 7 = 42 Marks)**

1	A steel bar ABCD is subjected to point loads P_1, P2, P3 and P_4 as shown in fig. Determine the magnitude of the force P3 necessary for equilibrium. If P_1=120kN, P_2= 220kN, and P_4= 160 kN. Also determine the net change in length of the steel bar. Take E=200GPa. 	MO 1.05	U
	OR		
2	Find the Youngs modulus of a steel specimen of 14mm diameter and length 200mm was found to elongate 0.2mm when it is subjected to a tensile load of 40kN.	MO 1.05	U
3	Draw SFD and BMD. 	MO 2.03	A
	OR		
4	List down the important points for drawing shear force and bending moment diagrams	MO 2.02	U
5	A rod of length 2m and diameter 25mm is fixed between end grips and is heated through 100^0C. Young's modulus for the material is $2x10^5$N/mm^2 and coefficient of linear expansion is $12x10^{-6}/^0$C. Calculate the stress induced and load on the end grips when (i) End grips are rigid and (ii) End grips yield by 2mm.	MO 1.05	U
	OR		
6	A simply supported beam of span 6m carries a u.d.l. of 2kN/m throughout and a central point load of 12kN. Find the position and magnitude of maximum deflection. E=200kN/mm2, I=$24x10^6$mm^4.	MO 3.04	A
7	A cylindrical shell 4m long, 1m diameter and 12mm thickness is subjected to an internal pressure of 1.2N/mm^2. Calculate the longitudinal and hoop stresses, change in diameter, length and volume. Take E=$2x10^5$ N/mm^2; $^1/_m$= 0.3	MO 4.03	U

	OR		
8	In a close-coiled spring, the diameter of each coil is to be 10 times that of wire of the spring and the maximum shear stress is not to exceed 60N/mm^2. Maximum permissible deflection under a load of 400N is 10cm. Taking the shear modulus as 9x10^4 N/mm^2, determine the diameter of the coil, number of coils and energy stored in the coil.	MO 4.02	U
9	The external and internal diameter of a hollow cast iron column is 50mm and 40mm respectively. If the length of the column is 3m and both of its ends are fixed, determine the crippling load using Rankines formulae. Take the values of σ_c = 550 N/mm^2 and $\alpha = {}^1/_{1600}$ in Rankines formula.	MO 3.05	U
	OR		
10	Derive the bending equation and discuss the assumptions for it.	MO 3.02	R
11	A thin cylinder of internal diameter 1.25m contains fluid at an internal pressure of 2N/mm^2. Determine the maximum thickness of the cylinder if (i) The longitudinal stress is not to exceed 30N/mm^2. (ii) The circumferential stress is not to exceed 45 N/mm^2.	MO 4.03	U
	OR		
12	State and prove Torsion equation.	MO 4.01	R