DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Regular & Supplementary Summer – 2023

Course: B. Tech. **Branch:** Mechanical Engineering **Semester : IV**

Subject Code & Name: **BTMES404 -Strength of Materials**

Max Marks: 60 **Date: 26/07/2023** **Duration: 3 Hr.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level /CO)	Marks
Q. 1	**Solve Any Two of the following.**		**12**
A)	**Derive from the fundamental, the relation for the deformation of a body, when it is subjected to** **a) A tensile force** **b) Its own weight.**	**R/CO-1**	**6**
B)	**A steel bar of 600 mm² cross sectional area is carrying loads as shown in fig. No. 1**	**U/CO-1**	**6**

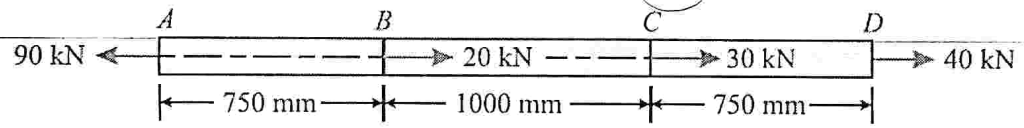

Fig. No. 1

C)	**An element in strained body is subjected to a tensile stress of 150 MPa and shear stress of 50 Mpa tending to rotate the element in and anticlockwise direction. Find (i) the magnitude of the normal and shear stresses on a section inclined at 40^0 with the tensile stress and (ii) The magnitude and direction of maximum shear stress that can exist on the element.**	**A/CO-1**	**6**
Q.2	**Solve Any Two of the following.**		**12**
A)	**A vertical round steel rod, 1.82 m long is securely held at its upper end and a weight sliding freely on the rod falls on to a stop at the lower end of the rod. When the weight falls from a height of 30 mm the maximum stress is reached in the rod is estimated to be 157 N/mm². Determine the stress if the load had been gradually applied and also the maximum stress if the load has fallen from a height of 45 mm. take E = 2 x 10^5 N/mm².**	**U/CO-2**	**6**
B)	**Derive the equation for Strain energy for** **i) Gradually applied load** **ii) Suddenly Applied load.**	**R/CO-2**	**6**

C) A rectangular strut 200 mm wide and 150 mm thick carries a load of 60 kN at an eccentricity of 20 mm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section. Also draw stress distribution diagram. A/CO-3 6

12

Q. 3 Solve Any Two of the following.

A) State the assumptions made in the theory of pure bending. R/CO-4 6

B) An I sections with rectangular ends, has the following dimensions: Flanges 150 mm x 20 mm, web 300 mm x 10 mm. Find the maximum shearing stress developed in the beam for a shear force of 50 kN. U/CO-4 6

C) A solid steel shaft has to transmit 100 kW at 160 r.p.m. taking allowable shear stress as 70 Mpa, find the suitable diameter of the shaft. The maximum torque transmitted in each revolution exceeds tye mean by 20 % A/CO-4 6

12

Q.4 Solve Any Two of the following.

A) State and explain the relation between R/CO-5 6

i) The load and Shear force

ii) The Shear force and Bending moment.

B) A simply supported beam of span 3 m carries two-point loads of 5 kN each at 1 m and 2 m from the left-hand support. Draw shear force and bending moment diagrams for the beam. U/CO-5 6

C) The intensity of loading on a simply supported beam of 6 m span increases gradually from 800 N/m run at one end to 2000 N/m run at another end as shown in fig. No. 2. Find the position and amount of maximum bending moment. Also draw the shear force and bending moment diagram. A/CO-5 6

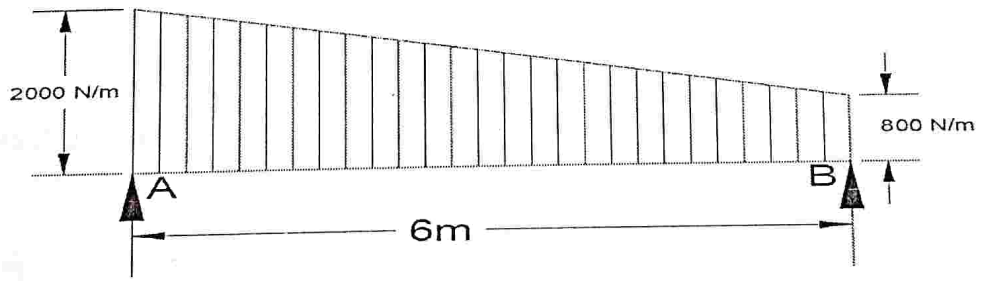

Fig. No. 2

12

Q. 5 Solve Any Two of the following.

A) Derive the equation for the slope and defection for the beam subjected to pure bending. R/CO-6 6

B) A simply supported beam AB of Span 5 m is carrying a point load of 30 kN at a distance 3.75 m from the left end A. Calculate the slopes st A and B and deflection under the load. Take EI = 26 x 10^7 N-mm^2. U/CO-6 6

C) Determine slope and deflection at the free end and at point C, 2 m from fixed end A for the cantilever beam shown in fig. No. 3 using moment area method. A/CO-6 6

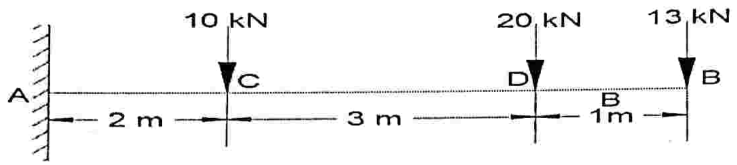

Fig. No. 3

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