Sanjay Ghodawat University, Kolhapur 2018-19

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017 EXM/P/09/01

**Year and Program:2018-19** **School of Technology** **Department of SY B.Tech**

**Course Code: CET 205** **Course Title: Structural Mechanics** **Semester – III**

**Day and Date** **End Semester Examination (ESE)** **Time:** **Max Marks: 100**

Thursday 06 Dec 18 2:30 pm to 5:30 pm

**Instructions:**
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.
4) Use of nonprogrammable calculator is allowed.

| | | | Marks | Bloom's Level | CO |
|---|---|---|---|---|---|
| Q.1 | a) | A straight uniform bar AD is clamped at both ends and loaded as shown in flg. 1. Initially the bar is stress free. Determine the stresses in all two parts (AB, BC) of the bar if the cross sectional area of the bar is 1000 $mm^2$. Take E = 2.1 x $10^5$ Mpa | 07 | $L_5$ | CO1 |

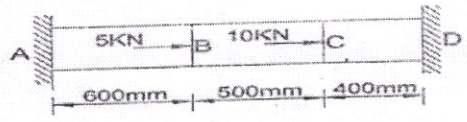

Fig 1

**OR**

| | | | | | |
|---|---|---|---|---|---|
| | | A rolled steel joist 6 m is at $15^0$C.<br>I) Calculate its elongation when the temperature is $40^0$C.<br>II) If elongation is prevented, calculate stress induced in a section.<br>$\alpha$ = 10 x $10^{-6}$ /$^0$C and E = 200 GPa. | 07 | $L_3$ | CO1 |
| | b) | A simply supported beam AB is 10 m long. It carries two point loads of 5 kN at 3 m and 7 m from A and a uniformly distributed load of 1kN/m in between two point loads. Draw shear force diagram of the beam. | 08 | $L_1$ | CO2 |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| | | Draw BMD for the beam as shown in fig. below. | 08 | $L_1$ | CO2 |

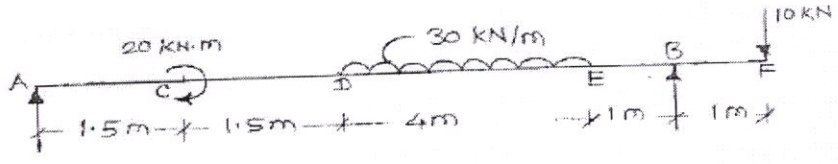

Fig. 2.



page1

| | | | | | |
|---|---|---|---|---|---|
| Q.2 | a) | A solid steel shaft has to transmit 100 kW at 200 rpm. Taking allowable shear stress as 80 N/mm2. Find the suitable diameter of shaft if the maximum torque exceeds the mean torque by 30 %. | 07 | $L_3$ | CO3 |
| | | **OR** | | | |
| | | A water pipe 850 mm diameter contains water at pressure head of 125m. Find the thickness of material required. If the permissible stress is 35 MPa and unit weight of water is 9810 $N/m^2$. | 07 | $L_3$ | CO3 |
| | b) | A steel pipe of 100 mm outer diameter is to be used as cantilever beam of length 2.4 m subjected to 5 kN point load at free end. The allowable bending stess in steel used is 165 MPa. Determine the minimum thickness of steel pipe to support the load. | 08 | $L_3$ | CO4 |
| | | **OR** | | | |
| | | Design the depth of a rectangular timber beam section of width 150mm. The beam is simply supported on span 4 m subjected to uniformly distributed load of 8 kN/m on entire span. Consider allowable stress in timber is 12MPa. | 08 | $L_3$ | CO4 |
| Q.3 | | **Solve any Two** | | | |
| | a) | Define the following terms:<br>1) Poisson's ratio and temperature stress<br>2) Draw stress-strain curve for ductile material and explain the significance of salient points. | 08 | $L_1$ | CO1 |
| | b) | Explain the following terms:<br>1) Point of contra flexure and its relationship with shear force diagram.<br>2) Define the term shear force and bending moment and its sign conventions. | 08 | $L_2$ | CO2 |
| | c) | Explain the following:<br>1) What is mean Polar Modulus?<br>2) Find Polar Modulus of Solid and hollow circular shaft. | 08 | $L_2$ | CO3 |
| | d) | Draw shear stress distribution for the following sections:<br>1) Isosceles triangle and Diamond shape.<br>2) Tee section and Hollow rectangular section. | 08 | $L_1$ | CO4 |
| Q.4 | | **Solve any Two** | | | |
| | a) | A rectangular beam 100 mm wide and 150 mm deep is subjected to shear force of 30 kN. | 09 | $L_3$ | CO5 |

Determine 1) Average shear stress

2) Maximum shear stress.

b) A T section beam having flange of 80 mm x 10 mm and Web 130 mm x 10 mm. Find maximum shear stress if its has to resist a shear force of 60 kN. 09 $L_3$ CO5

c) Draw shear stress distribution diagram for the beam shown in fig. 3, if the shear force acting on the beam is 60 kN. 09 $L_3$ CO5

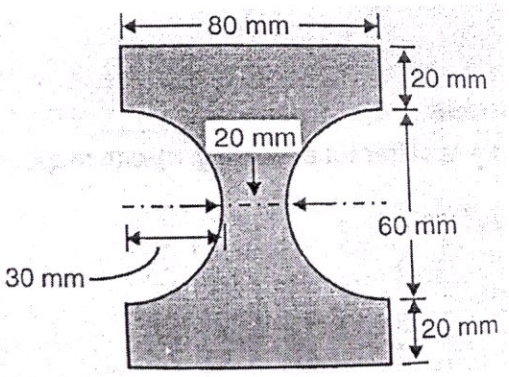


Fig 3

Q.5 **Solve any Two**

a) Calculate the stain energy in a bar 2.5 m long and 50 mm in diameter when it is subjected to gradually applied tensile load of 100 kN. What will be the modulus of resilience of the material at the bar? Take E = $2x10^5$. 09 $L_3$ CO6

b) A sliding weight of 700 N is dropped down a vertical rod which is suspended from the top and provided with a collar at the bottom end. The length of the rod is 900 mm and cross sectional area 200 $mm^2$. The length through which the weight falls before striking is 100 mm. 09 $L_3$ CO6

Determine 1) Elongation of the rod

2) Maximum tensile stress produced in rod

Take E = 210 x $10^3$ $N/mm^2$.

c) A simply supported beam AB is 6m subjected to o point load of 50 kN at mid point. Determine max deflection and take EI constant. 09 $L_3$ CO6



Pg 3

| | | | | | |
|---|---|---|---|---|---|
| Q.6 | **Solve any Three** | | | | |
| | a) | Draw shear stress distribution diagrams for I and T sections with maximum and average values. | 06 | $L_2$ | CO5 |
| | b) | Draw general shear stress distribution across the section of unsymmetrical I section and Box section. | 06 | $L_2$ | CO5 |
| | c) | Explain Terms:<br>i) Resilience.<br>ii) Modulus of resilience. | 06 | $L_2$ | CO6 |
| | d) | Explain strain energy stored due to sudden applied load. | 06 | $L_2$ | CO6 |

*****

page 4