Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma Engineering - SEMESTER–III • EXAMINATION – SUMMER 2013

Subject Code: 331904 **Date: 04-12-2013**

Subject Name: Strength of Materials

Time: 10:30 am - 01:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **English version is considered to be Authentic.**

Q.1 (a) (i) A steel bar 1 m long and 25mm diameter is subjected to an axial tension of 50KN. If Young's Modulus = 2 x 10^5 N/mm^2. Find Stress, Strain and Elongation in the bar. **05**

(ii) Define Modulus of Elasticity and Poisson's ratio. **02**

(b) (i) A steel rod 20mm diameter and 6m long is connected to two grips one at each end at a temperature of 120˚ C. Find the temperature stress induced when the temperature falls to 40˚ C, if the ends do not yield and if the ends yield by 1.10 mm. Take E=2 x 10^5 N/mm^2 and α=12 x 10^{-6} per ˚ C. **05**

(ii) Differentiate between ductility and malleability. **02**

Q.2

(a) A Copper rod 20mm in diameter is encased in a steel tube of 25mm internal diameter and 30mm external diameter. Their ends are rigidly connected. The composite section is 400 mm long and is subjected to an axial pull of 25KN. If E_s= 2.15 x 10^5 N/mm^2 and E_c= 1.1 x 10^5 N/mm^2, calculate the Stress induced in the rod and tube. **07**

(b) A weight of 120N is dropped from a height of 20mm on a bar which is of 10mm diameter and 1500 mm length. Find out the instantaneous Stress and Strain developed in the bar. Take E=2 x 10^5 N/mm^2. **07**

OR

(b) (i) A cylindrical shell has an internal diameter of 100mm and thickness of its wall is 12mm. If the steam pressure in the Shell is 5 N/mm^2, Find the Hoop Stress and Longitudinal Stress. **05**

(ii) Write the formula to calculate instantaneous Stress in the case of gradually applied load and suddenly applied load. **02**

Q.3

(a) A simply supported beam is loaded as shown in Figure 1. Calculate the Shear Force and the Bending Moment at various points. Draw Shear Force and Bending Moment diagram. **07**

(b) (i) A cantilever beam of 1m span and 200 x 200 mm in section carries a uniformly distributed load of 20KN/m. Find the maximum Bending Stress in the section. **05**

(ii) State the Perpendicular Axes Theorem. **02**

OR

Q.3 (a) A cantilever Beam of 1.75 m span is subjected to a Uniformaly Distributed Load 75 KN / m over entire span and a Point Load of 60 KN at free end. Find slope and defflection of the beam at free end . Take EI= 12 x 10^{13} N.mm^2. **07**

(b) (i) Draw the Shear Stress distribution diagrams for Rectangular **03**

section , I section and T section.

(ii) Draw the Core of the Rectangular and Circular Section. **04**

Q.4

(a) (i) A Circular Cast Iron column of diameter 250 mm carries a vertical load of 600KN at a distance of 35mm from the axis. Find the extreme values of Stress induced in the section. **05**

(ii) Define Slenderness Ratio and Radius of Gyration. **02**

(b) (i) A hollow steel tube of external diameter 40mm and 5mm thick is used as strut of 4m length. Both ends of the strut are hinged. Find Euler's crippling load, if $E=2 \times 10^5$ N/mm^2. **05**

(ii) List the various testing methods to determine Hardness and Impact strength. **02**

OR

Q. 4 (a) Find the normal, tangential and resultant stress on the plane AB as shown in Figure 2. **07**

(b) Determine the diameter of shaft which will transmit 120KW at 200RPM. The maximum Shear Stress limited to 80N/mm$^{2.}$ **07**

Q.5

(a) (i) Differentiate between Riveted Joint and Welded Joint. **04**

(ii) Mention the applications of Leaf Springs and Helical Springs. **03**

(b) (i) Explain Stiffness of Spring. **03**

(ii) Explain efficiency of Riveted Joint. **04**

OR

Q.5 (a) Explain the Brinell Hardness Test with a neat sketch. **07**

(b) Define the following Terms **07**

(i) Elasticity (ii) Plasticity (iii) Bulk Modulus
(iv) Strain Energy (v) Brittleness (vi) Hook's Law
(vii) Power Transmitted by Shaft

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Figure 1.

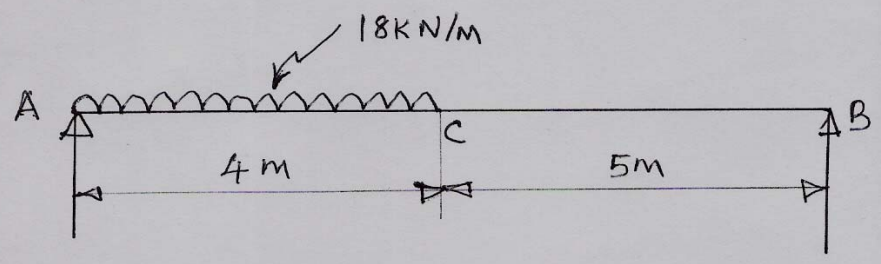
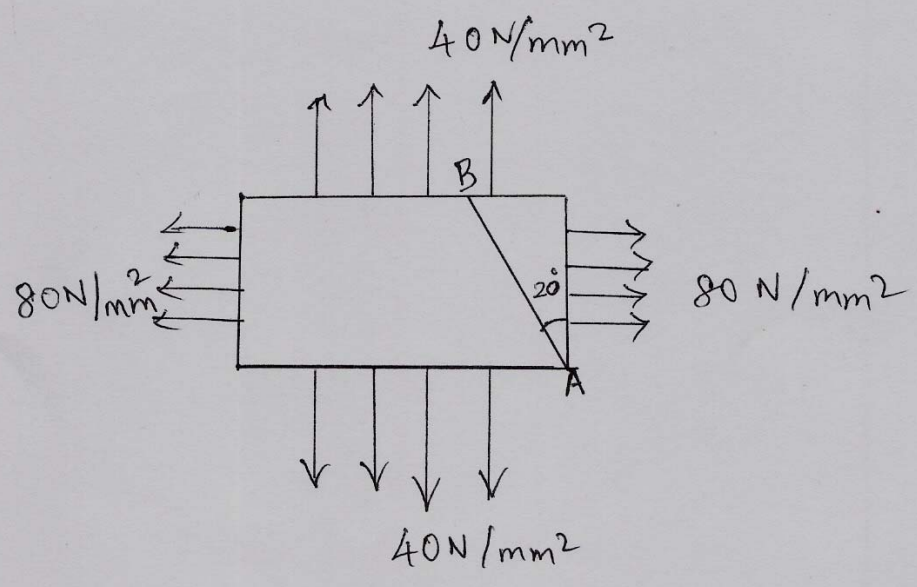
Figure - 2