Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA ENGINEERING – SEMESTER –III • EXAMINATION – WINTER 2016

Subject Code: 3330604 Date: 24/11/2016

Subject Name: Structural Mechanics

Time: 10:30 AM To 01:00 PM Total Marks: 70

Instructions:

1. **Attempt any five questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Each question carry equal marks (14 marks)**

Q.1 (a) Define the following terms: **07**
(1) Normal stress. (2) Linear strain. (3) Elastic limit. (4) Modulus of elasticity. (5) Poisson's ratio. (6) Bulk Modulus. (7) Shear stress.

(b) A member 2 m long and 100 wide and 50 mm thick in section is acted upon by an axial tensile force of 100 kN. If E = 2 x 10^5 kN/mm^2 and μ = 0.25; find out change in length; breadth and thickness. **07**

Q.2 (a) Draw stress – strain curve for mild steel and explain the following terms: **07**
(1) Proportional limit. (2) Elastic limit. (3) Yield stress. (4) Ultimate stress.

(b) A circular R. C. C. column of 250 mm diameter is reinforced with 6 bars of 20 mm diameter. The column is carrying an axial compressive load of 850 kN. Find stress induced in concrete and steel. Modular ratio (E_s/E_c) = 18. **07**

OR

(b) A weight of 40 kN falls on a vertical steel rod from a height of 20 mm. If the length of rod is 3 m and its cross section area is 1250 mm^2 , find instantaneous stress developed in bar and also calculate strain energy stored. Take E = 2 x 10^5 N/mm^2. **07**

Q.3 (a) (1) State and explain parallel axis theorem. **03**
(2) Define section modulus. **02**
(3) Define radius of gyration. **02**

(b) A specimen has modulus of rigidity 6 x 10^4 N/mm^2 and modulus of elasticity 1.5 x 10^5 N/mm^2. Determine the Poisson's ratio of the material. **07**

OR

Q.3 (a) Find moment of inertia about centroidal axes of I section consist of top and bottom flange 100 mm x 15 mm and web of size 10 mm x 230 mm. **07**

(b) (1) What is pure bending? Write assumptions made in pure bending. **04**
(2) Define shear force and bending moment at section. **03**

Q.4 (a) A simply supported beam of span 6 m, carries an u.d.l. of 1 kN/m over entire span and two point loads 2 kN and 6 kN at 2 m and 4 m from left support. Calculate the value of maximum bending moment and draw S. F. and B. M. diagram. **07**

(b) A simply supported beam has span 4 m and 250 mm x 400 mm cross section. It carries an u.d.l. of 20 kN/m over entire span. Find maximum bending stress and draw stress distribution diagram. **07**

OR

Q. 4 (a) A cantilever beam, 2 m span, carries a u.d.l. of 2 kN/m over a length of 1 m from fixed end and a point load of 2 kN at free end. Draw S. F. and B. M. diagram. **07**

(b) A cantilever beam of span 3 m is loaded with u.d.l. of 40 kN/m over its entire length. The cross section of beam is 200 mm wide and 400 mm deep. Draw shear stress distribution diagram for the section having max. shear force. **07**

Q.5 (a) A 4m long pipe having one end fixed and other end hinged is used as a column. It has outer diameter 40 mm and inner diameter 20 mm. For pipe material E = 2×10^5 N/mm^2 and f_c = 320 N/mm^2. Find (a) Buckling load by Eular's formula (b) Crippling load by Rankine's formula , Rankine's constant $\alpha = 1/7500$. **07**

(b) Determine forces in all members of cantilever truss loaded as shown in Fig. 1 by method of joint. **07**

OR

Q.5 (a) Define truss and state assumptions made in the analysis of trusses. **07**

(b) Determine forces in all members of simply supported truss loaded as shown in Fig. 2 by graphical method. **07**

****

ગુજરાતી

પ્રશ્ન. ૧	અ		૦૭
	બ		૦૭
પ્રશ્ન. ૨	અ		૦૭
	બ		૦૭
		અથવા	
	બ		૦૭
પ્રશ્ન. ૩	અ		૦૭
	બ		૦૭
		અથવા	
પ્રશ્ન. ૩	અ		૦૭
	બ		૦૭
પ્રશ્ન. ૪	અ		૦૭
	બ		૦૭
		અથવા	
પ્રશ્ન. ૪	અ		૦૭
	બ		૦૭
પ્રશ્ન. ૫	અ		૦૭
	બ		૦૭
		અથવા	
પ્રશ્ન. ૫	અ		૦૭
	બ		૦૭

****

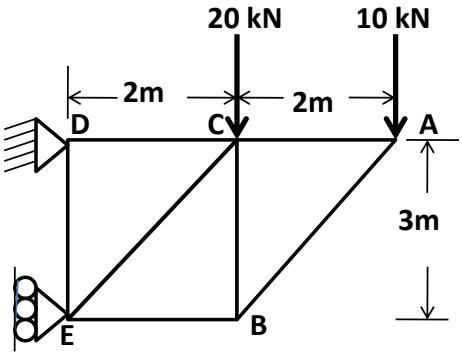

Fig.1

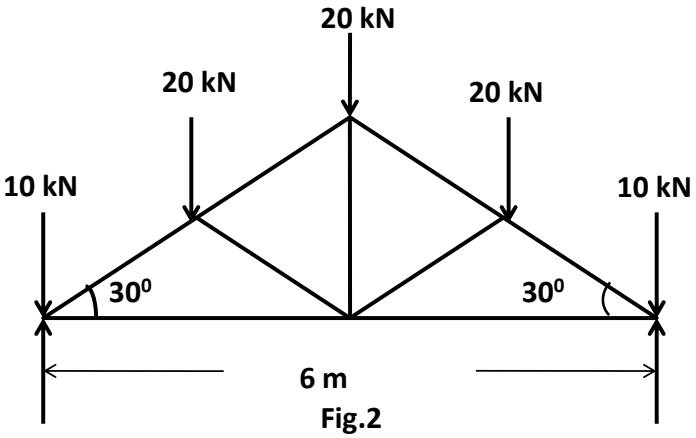

Fig.2