Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–II • EXAMINATION – SUMMER • 2014

Subject Code: X20603 **Date: 26-06-2014**

Subject Name: Structural Analysis-I

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.**

Q.1 **(a)** Define core of kernel. Sketch kern of rectangular section 500 x 800 mm and circular section with 600 mm diameter. **07**

(b) i) Find out SI and KI of the structures shown in the fig.1 **04**

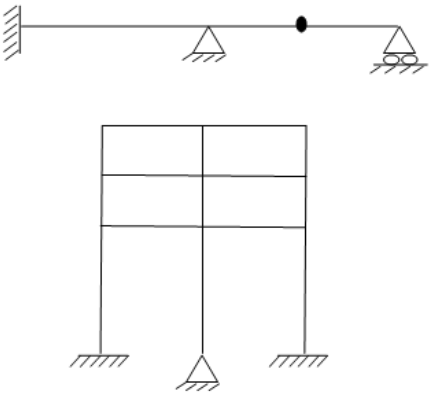

fig.1

ii) Write the expressions for strain energy stored due to bending, shear and torsion. Write meaning of each term. **03**

Q.2 **(a)** Draw influence line diagram for R_A, R_B & M_x for simply supported beam having span 6 m and point X is at 2 m from support A. **07**

(b) Two wheel loads of 50 kN & 25 kN, at a fixed distance apart of 2.2m, cross a beam of span 8 m. Draw the influence line for B.M & S.F for a point 3m from the left support. **07**

OR

(b) Draw the S.F and B.M diagram for the beam loaded as shown in the fig.2 **07**

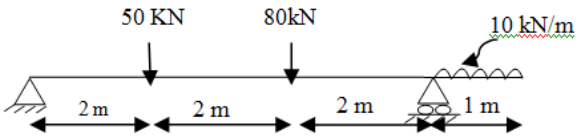

Fig.2

Q.3 **(a)** Find the slope and deflection at point B and C for the beam shown in the fig.3 using Macauly's method. Take EI=3000 kN.m^2 **07**

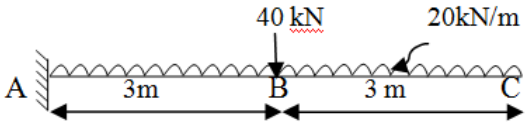

Fig.3

(b) Draw I.L.D. for a member U2L2, U2U3 & L_0L_1 for the truss shown in the fig.4 **07**

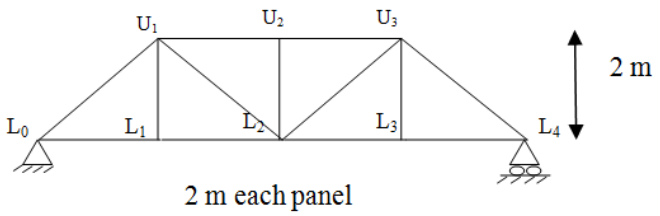

fig.4

OR

Q.3 **(a)** Find the slope at A and deflection under C for the beam shown in the fig.5 using conjugate beam method. Take EI=3000 kNm^2 **07**

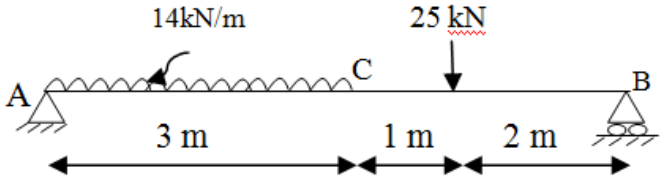

Fig.5

(b) A 300 mm x 200 mm rectangular section is used for a column to transmit a load of 200 kN. The load line is eccentric, being 60 mm above XX axis and 30 mm to the right of YY axis. Find out the stress at all four corners. **07**

Q.4 **(a)** A thin seamless spherical shell of 1.5m dia. is 8mm thick. It is filled with a liquid, so that the internal pressure is 1.5N/mm^2. Determine the increase in diameter & capacity of the shell. Take E=2x10^5Mpa & μ=0.3. **07**

(b) A three hinged parabolic arch has a span 20m & central rise 3m. It carries a point load of 15 kN at 8 m from the right hinge. Calculate normal thrust, shear & B.M at a section 7.5 m from left end hinge. Also calculate maximum positive B.M & it's position. Draw B.M diagram. **07**

OR

Q.4 **(a)** A bar of diameter 22 mm and length of 2m is attached with a collar at bottom. If the maximum stress developed is to be limited up to 150 N/mm^2, calculate the maximum value of weight that can be allowed to fall on the collar from 0.2m height. Assume E= 2x10^5 N/mm^2. **07**

(b) A column has both end fixed with length of 6.0 m. It is made up of a tube having external diameter of 180 mm and wall thickness of 10mm. If the yield strength of the material is 410 N/mm^2 and rankine's constant is 1/4800, calculate Euler's critical load and rankine's critical load. **07**

Q.5 **(a)** For torsion of a circular shaft, derive the equation T/IP = τ/R = Cθ/L with usual notations. **07**

(b) A solid steel shaft has to transmit 120 kW at 600 r.p.m. Find the diameter of the shaft if the shear stress is to be limited to 100 N/mm^2. Estimate the possible percentage saving in the material of the shaft if hollow shaft of internal diameter equals 0.8 times external diameter is replaced against solid shaft. **07**

OR

Q.5 **(a)** A light cable, 18 m long is supported at two ends at the same level. The supports are 16 m apart. The cable supports three loads of 20, 25 and 30 N dividing the 16 m distance in four equal parts. Find the shape of the string and the tension in various portions. **07**

(b) A cylindrical chimney 25 m high of uniform circular section is 5m external dia. & 2m internal dia. It is subjected to a horizontal wind pressure of 1400 N/mm^2. If the coefficient of wind pressure is 0.6 & unit wt. of masonry is 22 kN/m^3. Find the max^m &min^m stresses at the base of the section. **07**

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