Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEM-III Examination-Dec.-2011

Subject code: 130604 **Date: 24/12/2011**

Subject Name: Structural Analysis-I

Time: 2.30 pm -5.00 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) A shaft has to transmit 105 kW power at 160rpm.If the shear stress is not to exceed 65 N/mm^2 & the twist in a length of 3.5m must not to exceed 1°. Find suitable diameter. Take G=8 x 10^4 N/mm^2. 07

(b) A 100mm diameter shaft transmits 105kw power at 120rpm. A flanged coupling is keyed to the shaft, the key being 25mm wide & 140mm long. Six bolts of 20mm dia. are symmetrically arranged along a bolt circle of 280mm dia. Find the shear stress induced in the shaft, the key & bolts. 07

Q.2 (a) An unknown weight falls by 30mm on to a collar rigidly attached to the lower end of a vertical bar 4m long & 1000mm^2 in section. If the max^m instantaneous extension is found to be 3.66mm. Find the corresponding stress & the value of the unknown weight. Take E=2x10^5 N/mm^2. 07

(b) (1) State the Maxwell Reciprocal theorems. 07
(2) Define proof resilience, Modulus of resilience & Core of section.

OR

(b) 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=2x10^5 Mpa & 1/m=0.3. 07

Q.3 (a) A three hinged parabolic arch has a span 20m & central rise 3m. It carries a point load of 10kN at 7.5m from the left hinge. Calculate normal thrust, shear & B.M at a section 7.5m from right end hinge. Also calculate max +ve B.M & it's position. Draw B.M diagram. 07

(b) A cable loaded with 10kN/m is stretched between two supports in the same horizontal line 200m apart. If the central dip is 15m. Find the max^m & min^m pulls in the cable. 07

OR

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

(b) A concrete block has the cross-section as shown in fig 1. The block weighs 90kN & a vertical downward load of 20kN at P on the axis XX but eccentric about YY axis. Calculate the distance of the point P from the axis YY, if the pressure under the block along the edge AD is just twice the pressure under the edge BC & determine these pressures. 07

Q.4 (a) Two wheel loads of 16kN& 8kN, at a fixed distance apart of 2m, cross a beam of 10m span. Draw the influence line for B.M & S.F for a point 4m from the left abutment & find the max^{m} B.M & S.F at that point. 07

(b) A simply supported beam AB has a span of 8m.Draw influence lines for R_A, R_B,V_X & M_X for a section 3m from left end support. 07

OR

Q.4 (a) Draw IL diagram for forces in the members U_2U_3, L_1L_2, U_3L_3, U_2L_3 & L_1U_2 of a Pratt Truss as shown in fig 2. 07

(b) A train of loads as shown in fig 3 crosses a simply supported girder of span18m from left to right. Calculate max^{m} SF& BM at section 8m from left. 07

Q.5 (a) A simply supported beam of span 4m is carrying a point load of 100kN at it's mid span as shown in fig 4. Find slopes at supports & deflection at mid span. Take E=200 GPa, I=24x10^6 mm^4. 07

(b) Calculate Φ_B and Y_B for a cantilever beam loaded as shown in fig 5. Take E=200 GPa & I = 5 x 10^8 mm^4. 07

OR

Q.5 (a) Determine slopes at A & D and deflections at C & D for the overhanging beam loaded as shown in fig 6. Take E=200 GPa & I = 2 x 10^7 mm^4. Using Conjugate beam Method. 07

(b) Find the vertical & horizontal deflections of the joint C of the Truss loaded as shown in fig 7. The c/s areas of members CD & DE are each 2500mm^2 & those of other members are each 1250mm^2. Take E=200 GPa. 07

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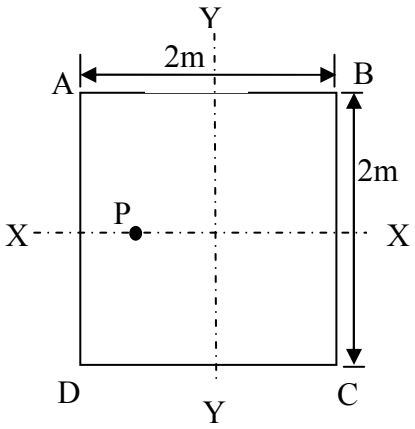
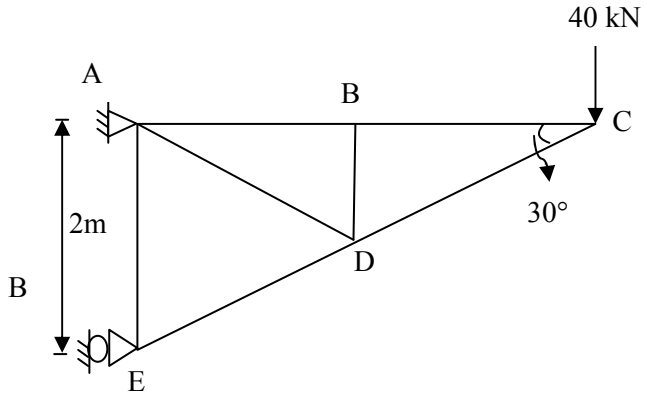
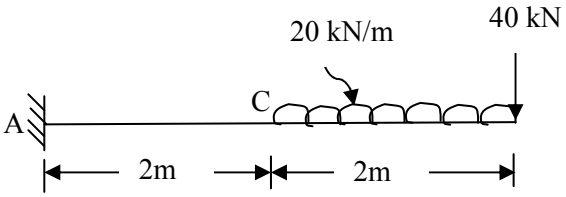


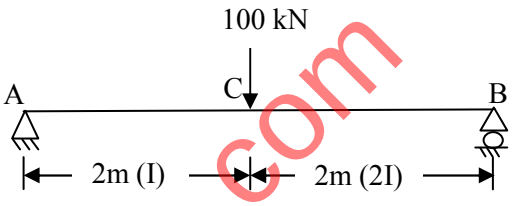
Q: 3 (b) (OR) Fig: 1



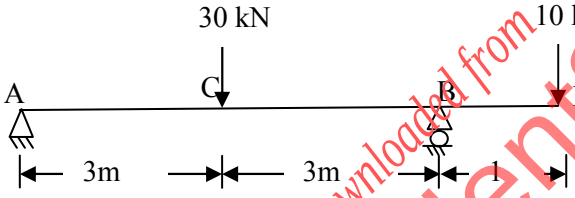
Q:5 (b) (OR) Fig: 7



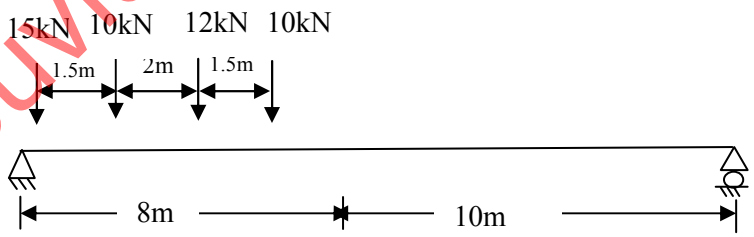
Q:5 (b) fig : 5



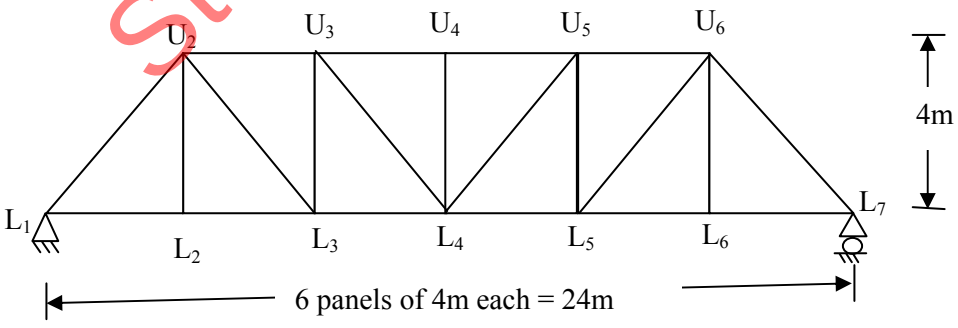
Q:5 (a) fig : 4



Q:5 (a) (OR) fig : 6



Q:4 (b) (OR) fig : 3



Q:4 (a) (OR) Fig:2