

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

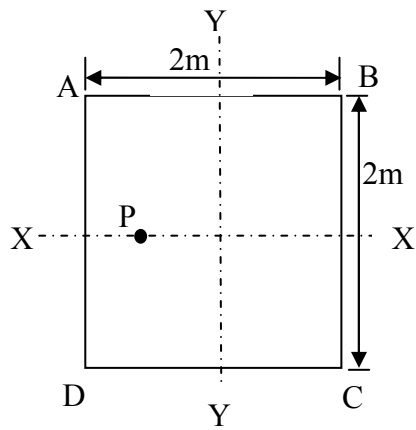
Total marks: 70

Instructions:

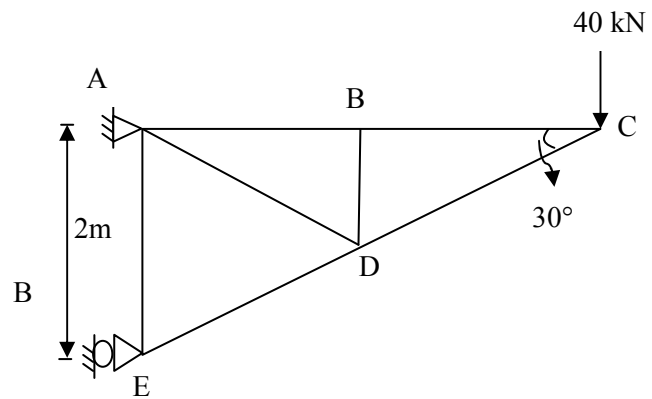
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- 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 $G=8 \times 10^4 \text{ N/mm}^2$. 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 $E=2 \times 10^5 \text{ N/mm}^2$. 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 1.5 N/mm^2 . Determine the increase in diameter & capacity of the shell. Take $E=2 \times 10^5 \text{ Mpa}$ & $1/m=0.3$. 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 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

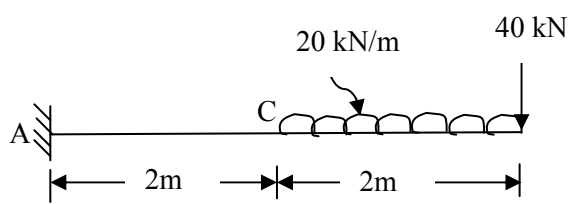
- (b) A concrete block has the cross-section as shown in fig 1. The block weighs 90kN & a vertical downward load of 20kN at P on the axis XX but eccentric about YY axis. Calculate the distance of the point P from the axis YY, if the pressure under the block along the edge AD is just twice the pressure 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 span 18m 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 its mid span as shown in fig 4. Find slopes at supports & deflection at mid span. Take $E=200 \text{ GPa}$, $I=24 \times 10^6 \text{ mm}^4$. 07
- (b) Calculate Φ_B and Y_B for a cantilever beam loaded as shown in fig 5. Take $E=200 \text{ GPa}$ & $I=5 \times 10^8 \text{ mm}^4$. 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 $E=200 \text{ GPa}$ & $I=2 \times 10^7 \text{ mm}^4$. 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 2500 mm^2 & those of other members are each 1250 mm^2 . Take $E=200 \text{ GPa}$. 07



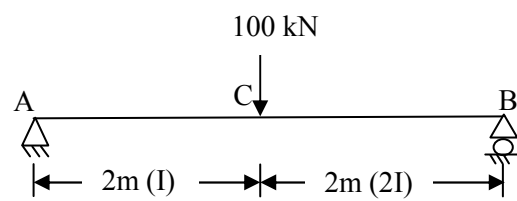
Q: 3 (b) (OR) Fig: 1



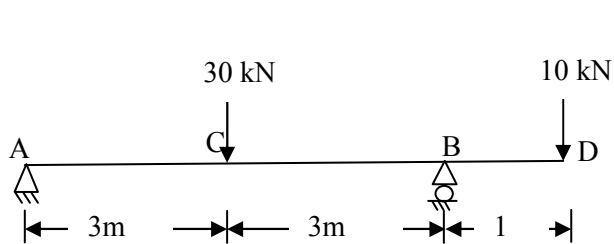
Q:5 (b) (OR) Fig: 7



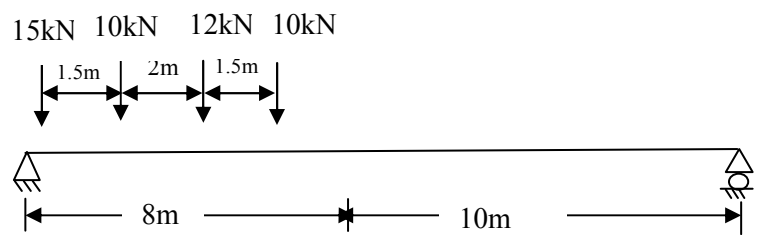
Q:5 (b) fig : 5



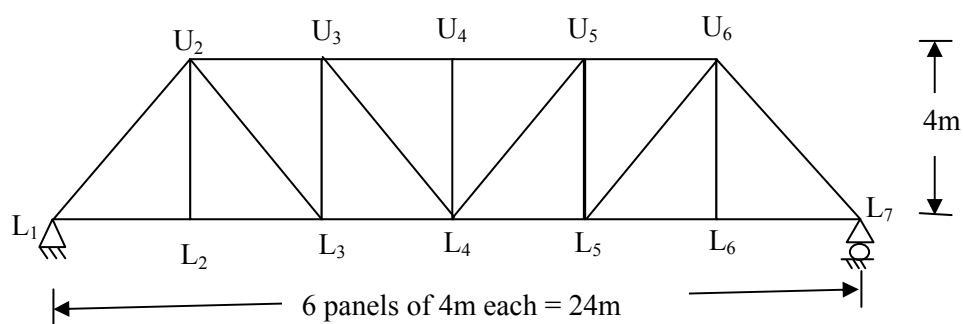
Q:5 (a) fig : 4



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



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



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