BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR
B.E. 6th SEMESTER (CE) EXAMINATIONS, 2013
Structural Analysis II (CE – 602)

Full Marks: 70 **Time: 3 hrs**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.
Assume any suitable data, if necessary.
Symbols and abbreviations have their usual meanings.

FIRST HALF

(All questions are of equal value)

Q.1) A continuous beam ABC fixed at A and hinged at C is supported by a column BD which is rigidly connected to the beam ABC at B. It is loaded as shown in Fig.Q.1. Analyze the frame by Slope Deflection Method and draw the B.M. Diagram.

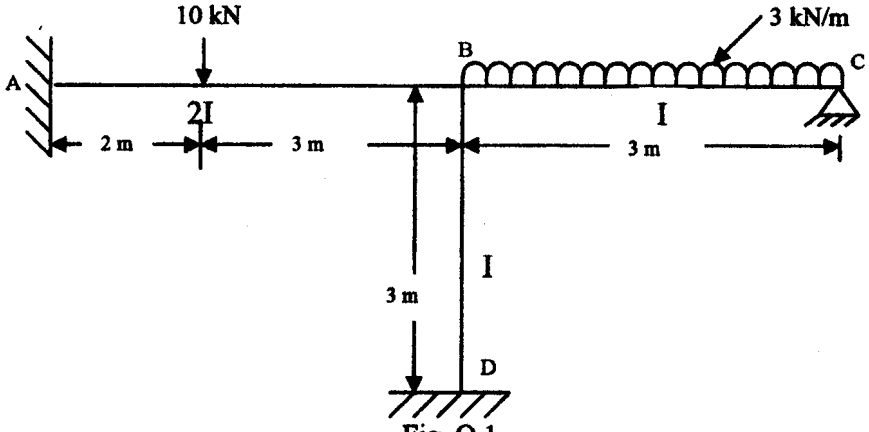

Fig. Q.1

(11)

Q.2) Using Moment Distribution Method, analyze the portal frame shown in Fig.Q.4 and draw the B.M. Diagram. The ends A and D are fixed and BC is loaded with u.d.l. of 6 kN/m.

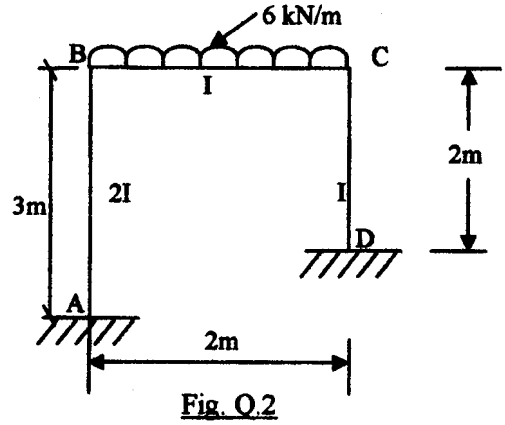

Fig. Q.2

(11)

Q.3) A suspension bridge of span 150m has two nos. of 3-hinged stiffening girders supported by two cables with a central dip of 10m. The width of the roadway supported by the girders is 5 m. The dead load is 7 kN/m^2 of floor area and a live load of 10 kN/m^2 covers the left hand half of the bridge. Find the S.F. and the B.M. at the loaded quarter span point. Determine also the maximum tension in the cable. (11)

Q.4) A parabolic arch, hinged at the ends has a span of 30m and central rise 5m. A concentrated load of 120 kN acts at 10m from the left support. The second moment of inertia varies as the secant of the slope of the rib axis. Calculate the horizontal thrust and the reactions at the hinges. Calculate the maximum B.M. in the arch and draw the B. M. Diagram. Neglect the effect of rib shortening.

(11)

Q.5) A suspension bridge of span 120m and dip 10m with supports at the same level carries a u.d.l. of 10 kN/m.

(a) Find the vertical and horizontal forces transmitted to the vertical pylons if (i) the cable is passed over a pulley; (ii) if the cable is clamped to a saddle with rollers at the end of the pylon. The anchor cable makes an angle of 30^0 to the horizontal at the pylon.

(b) Find the increase in the dip of the cable if the cable is subjected to a temperature rise of 28°C. Take $\alpha = 12 \times 10^{-6}/^{o}C$. Derive the expressions that you use.

(3+3+5=11)

SECOND HALF

Q.6) (a) Comment on the relative merits of the Displacement method as compared to the Force method of analysis.

(b) Three pin-jointed bars meet at 'O' as shown in Fig. Q.6. A 50 kN load is acting at 'O'at an angle of 45° as shown. Compute the joint displacements at 'O' and the member forces by the Stiffness Method of analysis. Given : E=250kN/m^2. The cross-sectional areas of the members are indicated in parenthesis.

(4+7=11)

Q.7) State Muller Breslau's Principle. Using this Principle, construct the influence line diagram for the reaction at A for the two-span continuous beam ABC shown in Fig. Q.7. Determine the influence line coordinates at 2m intervals and plot them.

(3+8=11)

Q.8) Analyze the beam shown in Fig. Q.8 by the Displacement method and draw the B.M. Diagram. Note: shear and axial deformations of the beam may be neglected.

(11)

Q.9) The link shown consists of two semi-circles and two straight portions of constant section throughout. It is subjected to the action of two equal and opposite axial forces 'P' applied as shown in Fig. Q.9. Assuming that the c/s dimensions of the link are small in comparison to 'R', determine the increase in the dimension AD and the shortening of GH. EI=constant.

(11)

Q.10) In the pin jointed frame shown in Fig. Q.10, member AD had a lack of fit. It was longer than the required length by 2mm. Find the forces in the members when the member AD is forced into position. The diagonal members are each 12cm^2 in area, while the remaining members are 20cm^2 in area. Given E = 2 x 10^5 N/mm^2.

(11)

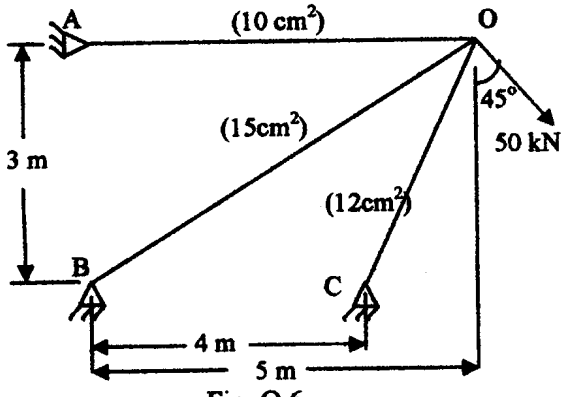

Fig. Q.6

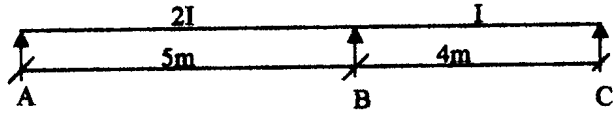

Fig. Q.7

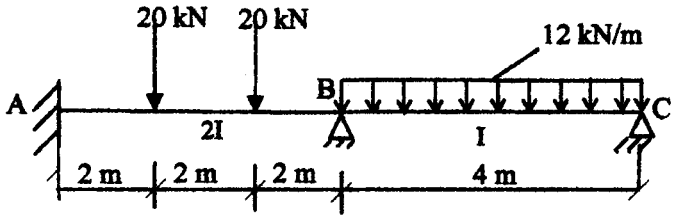

Fig. Q.8

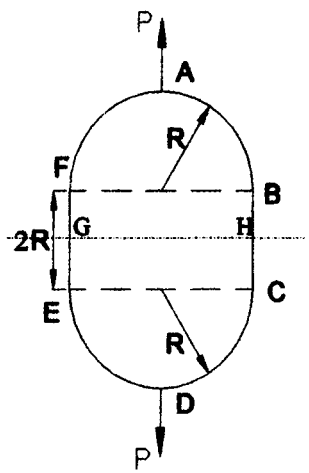

Fig. Q.9

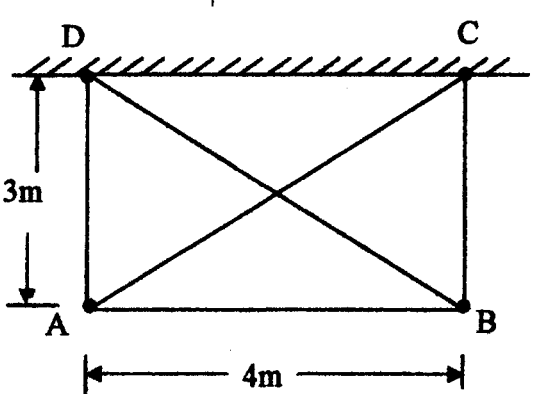

Fig. Q.10