**BENGAL ENGINEERING AND SCIENCE UNIVERSITY, SHIBPUR**
**B.E. 6th SEMESTER (CE) EXAMINATIONS, 2012**
**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.*

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## FIRST HALF

*(All questions are of equal value)*

Q.1) A beam ABC, 14 m long, fixed at A and C and continuous over support B is loaded as shown in Fig.Q.1. Calculate the end moments and draw the B.M. Diagram and S. F. Diagram. Use either the Moment Distribution Method or the Slope Distribution Method of analysis.

Q.2) A suspension cable of span 120m and central dip 10m is supported at the same length and is subjected to a u.d.l of 5 kN/m length of its horizontal span. Calculate the maximum and minimum tensions in the cable. Also find the horizontal and vertical forces transmitted to each supporting pier if (a) the cable is passed over a smooth pulley (b) the cable is clamped to a saddle with rollers on the top of the piers. The anchor cable makes an angle of 25° to the horizontal at the piers. Derive the formula that you use.

Q.3) A parabolic two-hinged arch has a span '$L$' and central rise '$r$'. Derive the expression for the horizontal thrust at the hinges due to a u.d.l '$w$' over the whole span. Hence show that the B.M and the S.F. at any section of the arch is zero. Also derive the expression for the normal thrust at a section of the arch.

Q.4) Analyze the portal frame shown in Fig.Q.4 by using either the Moment Distribution Method or the Slope Deflection Method and draw the B.M. Diagram.

Q.5) The cables of a suspension bridge have a span of 80m and a central dip of 8m. Each cable is stiffened by a three-hinged stiffening girder. The width of the roadway supported by the girders is 5m. The dead load is 4 kN/m$^2$ of floor area. In addition there is a live load of 12 kN/m$^2$ that covers the right hand half of the bridge. Draw the B.M. Diagram and the S.F. Diagram for each girder, indicating the maximum values. Also calculate the maximum tension in each cable.

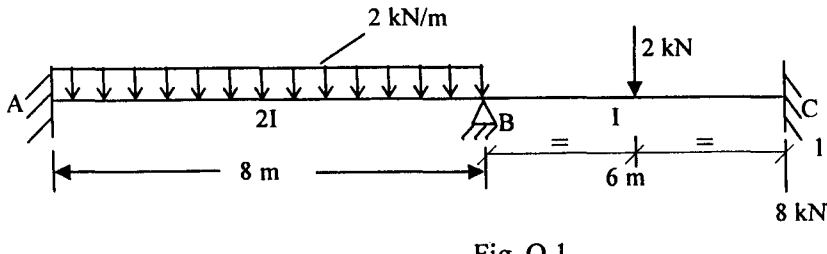


Fig. Q.1

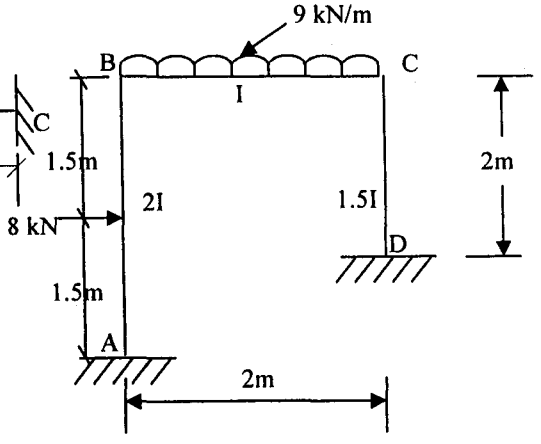


Fig. Q.4

## SECOND HALF

Q.6) (a) Three pin-jointed bars meet at 'O' as shown in Fig. Q.6. A 60 kN load is acting downward at 'O'. Compute the joint displacements at 'O' and the member forces by the Displacement Method of analysis. Given : E=250kN/m$^2$. The cross-sectional areas of the members are indicated in parenthesis.

(b) Distinguish between the Force and Displacement methods of analysis.

(7+4=11)

Q.7) For the two span continuous beam shown in Fig. Q.7, draw the influence line diagram for the B.M. at the midpoint of span BC. Determine the influence line coordinates at 2m intervals and plot them. EI = constant.

(11)

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

(11)

Q.9) Determine the maximum B.M. and increase in the vertical diameter AC of the ring under the action of forces 'P' applied as shown in Fig. Q.9. EI=constant.

(11)

Q.10) All the members of the plane truss shown in Fig. Q.10 have the same cross-sectional area of 25cm$^2$. Find the forces in the members due to a rise in temperature of member CD by 22°C. Given: E=2 x 10$^5$ N/mm$^2$; $\alpha$ = 0.000012/°C.

(11)

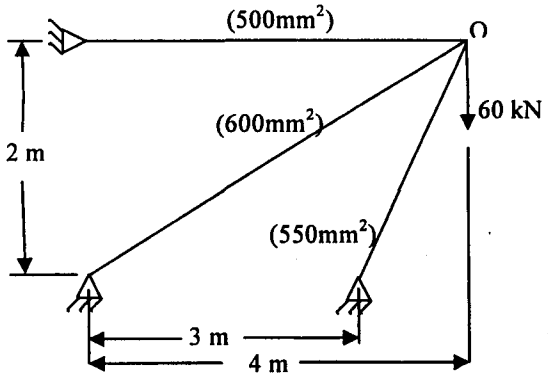


Fig. Q.6

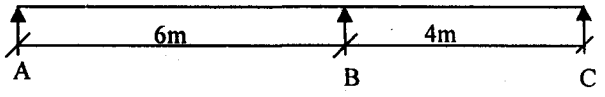


Fig. Q.7

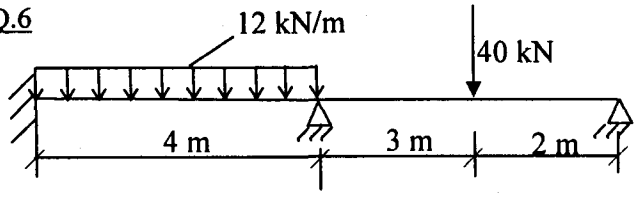


Fig. Q.8

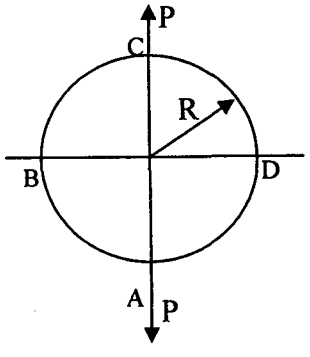


Fig. Q.9

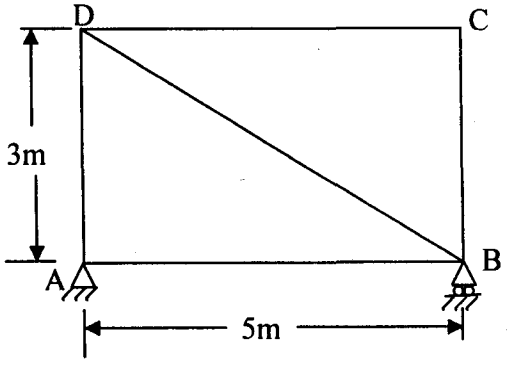


Fig. Q.10