COLLEGE OF ENGINEERING, PUNE
S.Y.B. Tech. (Civil Engineering)
(CE208/CE210) Structural Mechanics I
End - Semester Examination: April 2013

Year: 2012-13   **Semester: Spring**
Max. Marks: 50   Time: 3 Hours

Instructions: 1. **ALL** Questions are compulsory.
                     2. Assume suitable data if necessary.

Q.1 (a) Determine the degree of static indeterminacy of the (i) plane frame shown in   [02]
          Fig. Q.1 (a)(i) with all internal joints rigidly connected and (ii) pin jointed
          frame as shown in fig. Q.1(a)(ii).
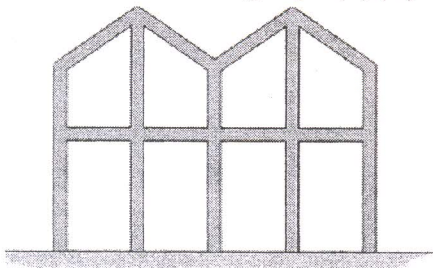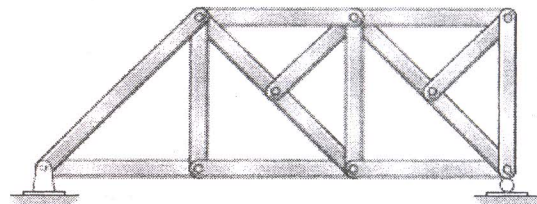

Fig. Q.1 (a) (i)   Fig. Q.1 (a) (ii)

(b) Explain the concept of carry over factor and distribution factor with   [03]
     illustration. What is the sum of distribution factors for all the members
     meeting at a joint?

(c) Determine the horizontal displacement of joint B of the truss shown in   [05]
     Fig. Q. 1 (c). Each steel member has a cross sectional area of 300 mm^2.
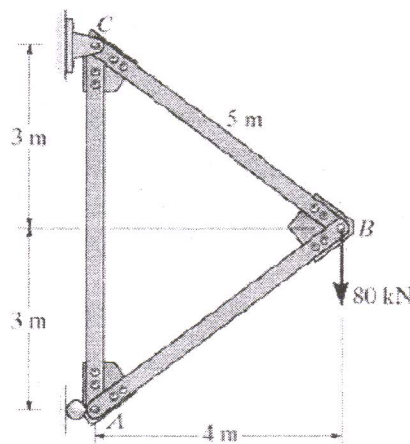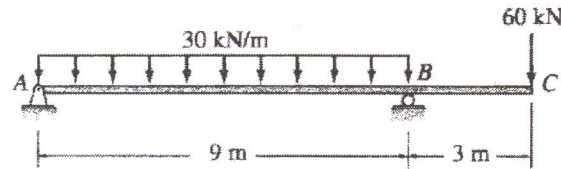 $E = 200$ GPa.

Fig. Q. 1 (c)

Q.2 (a) Determine the deflection at point C of the beam shown in Fig. Q. 2 (a) by unit [05] load method.

60 kN

30 kN/m

A

B

C

9 m

3 m

$EI =$ constant
$E = 200$ GPa
$I = 800(10^6)$ mm^4

Fig. Q. 2 (a)

(b) Determine the horizontal displacement of point A on the angle bracket due to [05] concentrated force P. The bracket is fixed connected to its support. EI is constant. Consider only effect of bending. Use Castigliano's theorem.
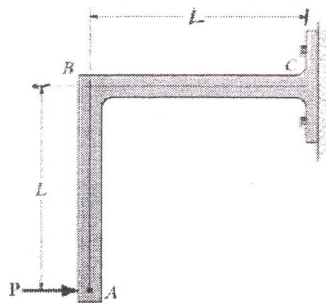
L

B

C

L

P

A

Fig. Q. 2 (b)

Q.3 (a) Determine the reactions at the supports for the beam shown in Fig. Q. 3 (a). [05] Assume the support at B is a pin and supports A and C are rollers. EI is constant. Use method of consistent deformations.
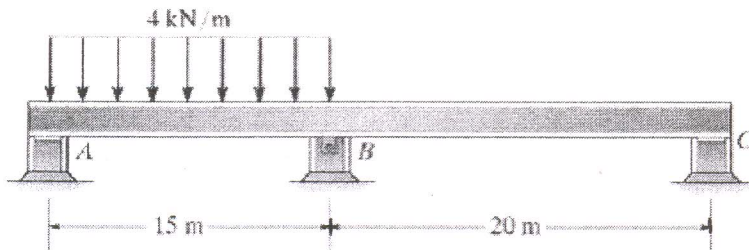
4 kN/m

A

B

C

15 m

20 m

Fig. Q. 3 (a)

(b) Fig. Q. 3(b) shows a fixed ended beam of constant flexural rigidity. Support B [05] settles 35 mm without any rotation taking place. Show that the bending moment induced at B due to settlement alone is 0.0084EI. Use Castigliano's method.
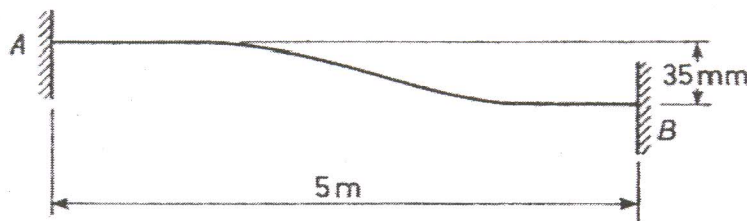
A

35 mm

B

5 m

Fig. Q. 3 (b)

Q.4 (a) Determine the reaction and draw the shear and bending moment diagrams for [05] the continuous beam shown in Fig. Q. 4(a) due to settlement of 20 mm at support B. Use slope-deflection method.
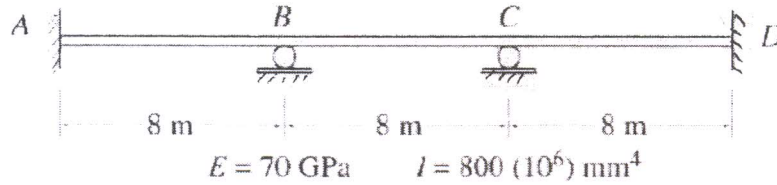

Fig. Q. 4 (a)

(b) Determine the member end moments for the continuous beam shown in [05] Fig. Q. 4(b) by using moment-distribution method.
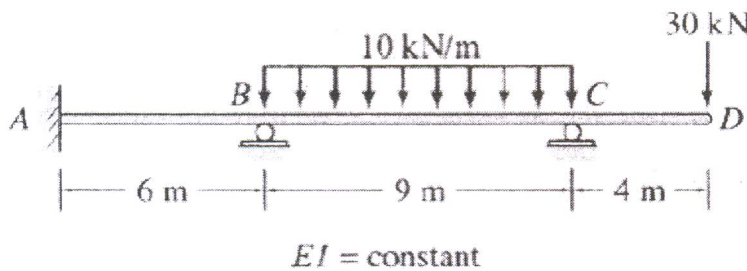

Fig. Q. 4 (b)

Q.5 (a) Construct the influence line for the shear and moment at point C of the beam [05] shown in Fig. Q. 5 (b).
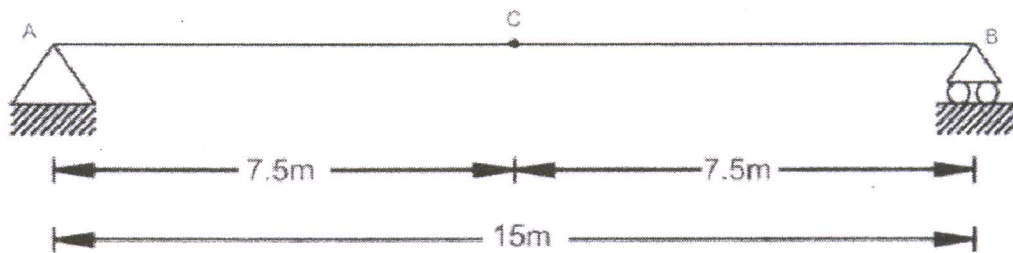

Fig. Q. 5 (a)

(b) Find the maximum positive live shear at point C when the beam shown in [05] Fig. Q.5 (a), when it is loaded with a concentrated moving load of 10 kN and UDL of 5 kN/m.

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