

## B.Tech 6th Semester Exam., 2015

## STRUCTURAL ANALYSIS—II

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. **1** is compulsory.

1. Choose the correct option (any seven) :  $2 \times 7 = 14$ 

(a) Theorem of three moments is used for analyzing

- (i) fixed beam
- (ii) curved beam
- ~~(iii) continuous beam~~
- (iv) All of the above

(b) The reaction at the level prop at a free end of a cantilever of span  $l$  carrying u.d.l. @  $w$ /unit length is

- (i)  $\frac{wl}{8}$
- (ii)  $\frac{wl}{4}$
- ~~(iii)  $\frac{3wl}{8}$~~
- (iv)  $\frac{5wl}{8}$

AK15-1120/586

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( 2 )

(c) What is the statical indeterminacy of the following beam?



- (i) 1
- (ii) 3
- (iii) 2
- (iv) None of the above

(d) A rigidly fixed beam of span  $l$  carries a point load  $W$  at its mid-span. Maximum deflection is

- (i)  $\frac{Wl^3}{384EI}$
- (ii)  $\frac{Wl^3}{192EI}$
- (iii)  $\frac{Wl^3}{96EI}$
- (iv)  $\frac{Wl^3}{48EI}$

(e) The line elements are suitable for the analysis of

- (i) one-dimensional problem
- (ii) two-dimensional problem
- (iii) three-dimensional problem
- (iv) None of the above

AK15—1120/586

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( 3 )

(f) The two-hinged arch is statically indeterminate to

- (i) 3rd degree
- (ii) 1st degree
- (iii) 2nd degree
- (iv) None of the above

(g) In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always

- (i) zero
- (ii) less than 1
- (iii) 1
- (iv) greater than 1

(h) When a uniformly distributed load longer than span of the girder, moves from left to right, then the maximum bending moment at mid section of span when the uniformly distributed load occupies

- (i) less than the left-half span
- (ii) whole of left-half span
- (iii) more than the left-half span
- (iv) whole span

AK15—1120/586

( Turn Over )

( 4 )

(i) The principal of superposition is applicable when

- (i) the deflections are linear functions of applied forces
- (ii) the material obeys Hooke's law
- (iii) the action of applied forces will be affected by small deformations of structure

(iv) None of the above

(i) The elements of flexibility matrix of a structure

- (i) are dependent on the choice of coordinates
- (ii) are independent on the choice of coordinates
- (iii) are always dimensionally homogeneous
- (iv) Both (i) and (ii)

2. A cantilever of span  $l$  is carrying u.d.l. at the rate  $w$ /unit length on a length  $l_1$  from the fixed end. Determine the slope and deflection at the free end. Use conjugate beam method. 14

AK15-1120/586

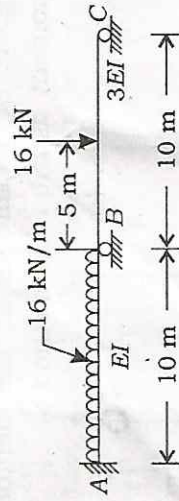
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( 5 )

3. A beam of total length  $2l$  is simply supported on three rigid supports. Two supports are at the end and one at the middle of the beam. Whereas the moment of inertia of the right span of the beam is  $I$ , that of the left span is  $2I$ . The right span carries a point load  $wl$  at its mid-span and the left span carries a u.d.l. at the rate of  $w$  per unit length. Calculate the reactions at all supports. 14

4. A cantilever of uniform flexural stiffness is propped at the remote end. Find the load on the prop when a load  $W$  is applied at the centre of the cantilever. 14

5. Using the flexibility method, analyse the continuous beam shown in the following figure : 14

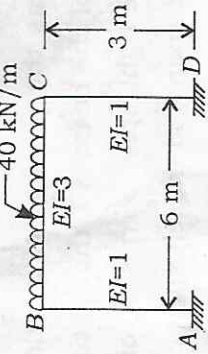


AK15-1120/586

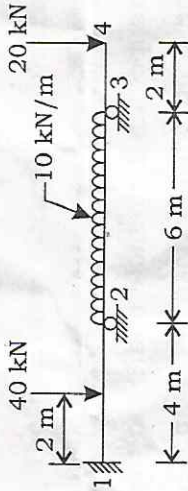
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6. Using the stiffness method of analysis obtain the moments at the ends of members for the portal frame shown in the following figure : 14

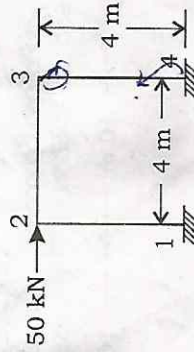


7. A continuous beam is supported and loaded as shown in the following figure :



- During loading support 2 sinks by 10 mm, analyze the beam for support moments and reactions.  $E = 200 \times 10^6 \text{ kN/m}^2$  and  $I = 100 \times 10^{-6} \text{ m}^4$  constant throughout. 14

8. Determine the support moments of the members of the frame shown in the following figure.  $EI$  is same for all the members. Use moment distribution method : 14



AK15-1120/586

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( 7 )

9. A beam of span  $l$  is fixed on one end and simply supported at the other end. It carries a u.d.l. of  $w$ /meter run over the whole span. Find the reaction at the simply supported end by the principle of least work. 14

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AK15-1120/586

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