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320451(20)

B. E. (Fourth Semester) Examination, April-May 2021

(New Scheme)

(Civil Engg. Branch)

STRUCTURAL ANALYSIS-I

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of all question is compulsory. Attempt any two part from (b), (c) & (d).*

Unit-I

1. (a) Determine the degree of static indeterminacy for the rigid frame shown in figure (1). 2

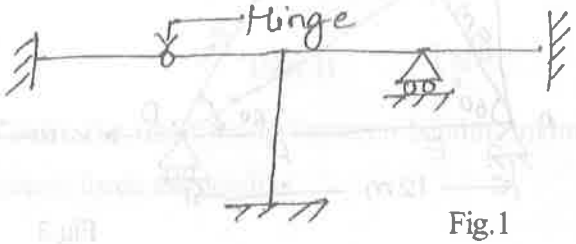


Fig.1

(b) (i) Explain degree of static indeterminacy and Kinematic indeterminacy. 4

(ii) Compute Kinematic Indeterminacy (Degree of freedom of the given frame) Shown in figure (2). Considering columns to be axially rigid. 3

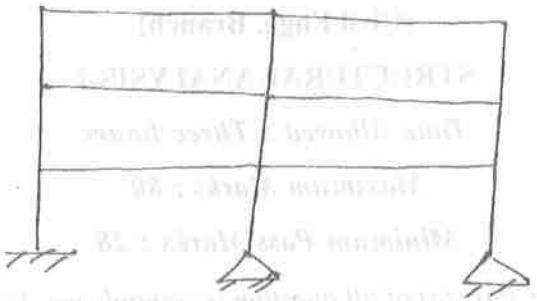


Fig.2

(c) A truss shown in fig (3) below is loaded with two point loads of 2P and P kN at joints B and C. Determine the forces in all the members 2P. 7

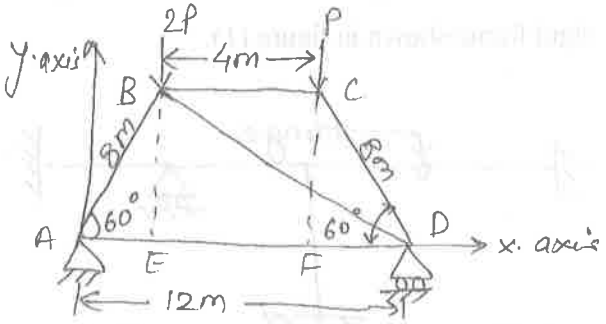


Fig.3

(Members AB = CD = 8 m)

BC = 4 m

AD = 12 m

(d) A space frame shown in fig.(4) is supported at *A,B,C* and *D* in a horizontal plane, through ball joints. The member *EF* is horizontal and is at a height of 3 m above the base. The loads at joints *E* and *F* shown in figure act in a horizontal plane. Find the forces in all the members of the frame. 7

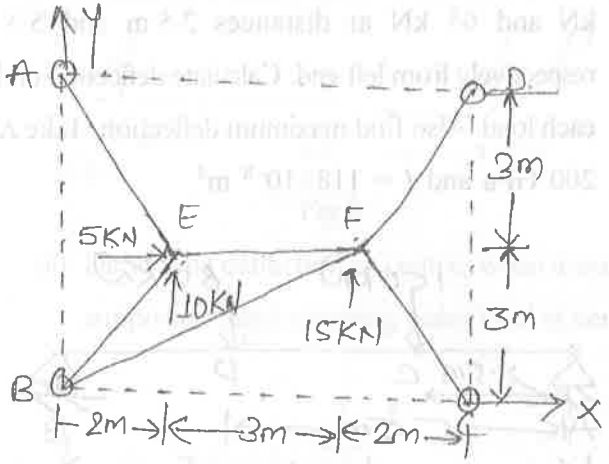


Fig.4

Unit-II

2. (a) Write the relationship between bending moment, shear force and loading. 2

(b) Determine slope and depletion in a simply supported beam carrying udl (W kN/m) over a length of *l*. Using double integration method. 7

Fig.5

(c) A beam of uniform section, 10 m long in simply supported at the ends. It carries point loads of 150 kN and 65 kN at distances 2·5 m and 5·5 m respectively from left end. Calculate deflection under each load. Also find maximum deflection. Take E = 200 GPa and $I = 118\times10^{-8}$ m^4. 7

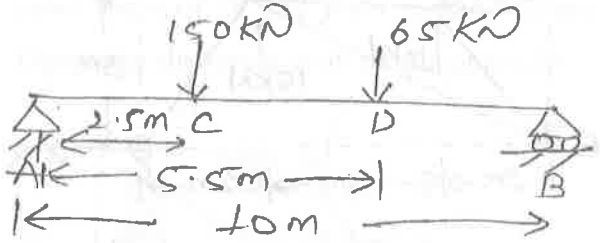


Fig.6

(d) Using (Mohr's) area moment method. Determine slope and deflection at B and C in a cantilever beam. 7

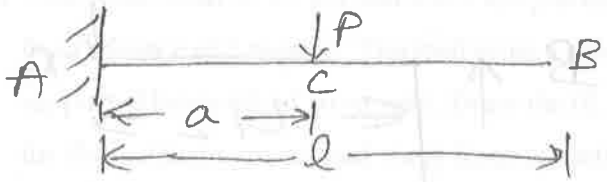


Fig.7

Unit-III

3. (a) Explain castiglianos theorem. 2

(b) (i) Determine the deflection under the load, when a cantilever beam is under point load at free end. 3

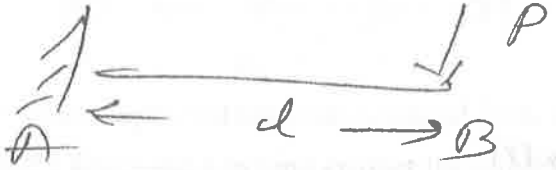


Fig.8

(ii) Determine deflection at centre, when a simply supported beam carrying point load at centre. 4

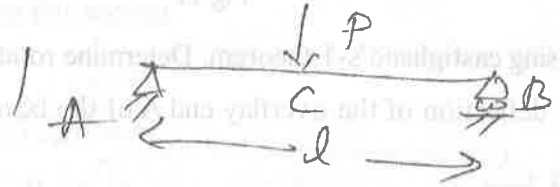


Fig. 9

(c) Find Horizontal Deflection at A. 7

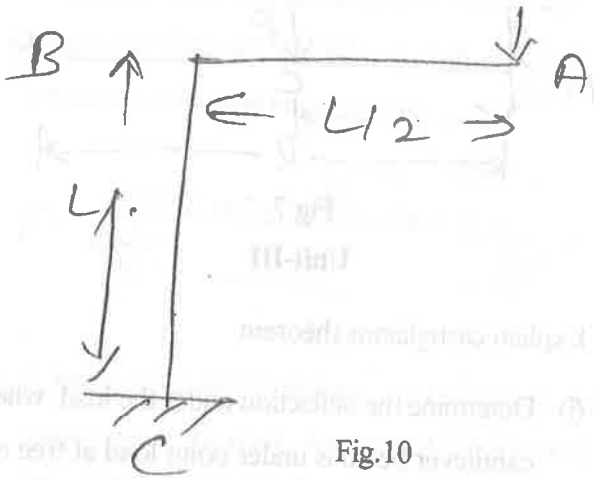


Fig.10

(d)

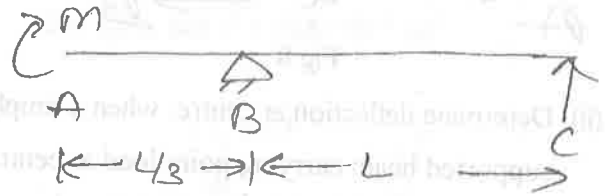


Fig.11

Using castigliano's-1 theorem. Determine rotation & deflection of the overflay end A of the beam. 7

Unit-IV

4. (a) Define influence line diagram and its uses. 2

(b) Two wheel load of 16 kN and 8 kN are placed at fixed distance of 2 m apart. The load cross a simply supported beam AB of 10 m span. Draw the (ILD) for the bending moment and shear force at section 'C' (4 m) from the left Abutment and find the max. bending moment and shear force at that point. 7

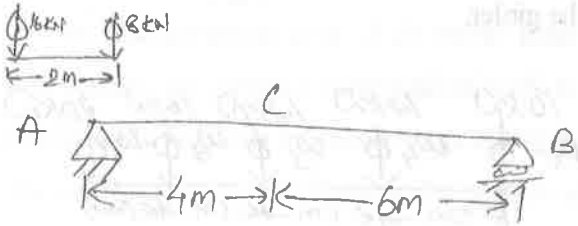


Fig.12

(c) A simply supported beam has a span of 15 m. A udl of 25 kN/m and 4 m long crosses the girder from left to right. Draw the Ild for shear force and bending moment at section (6 m) from the left support. Also calculate maximum shear force and bending moment at this section. 7

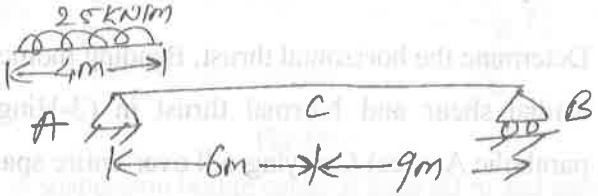
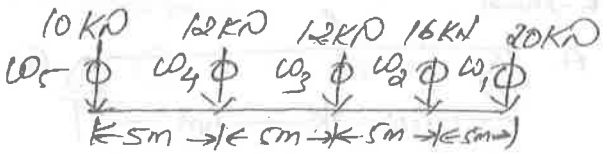


Fig.13

(d) Five point loads of 10 kN, 12 kN, 12 kN, 16 kN and 20 kN spaced at 5 m centre to centre rolls over simply supported girder of 80 m. The load moves left to right with 20 kN load leading, then calculate position and magnitude of maximum bending moment which may occur any where on the girder. 7



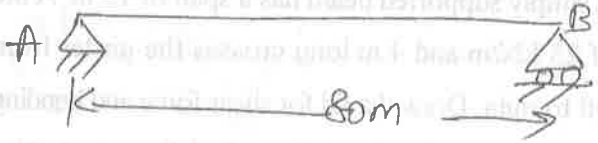


Fig.14

Unit-V

5. (a) Comparison between Arches and cable. 2

(b) Determine the horizontal thrust, Bending moment, Radial shear and Normal thrust in (3-Hinged parabolic Arches) Carrying udl over entire span. 7

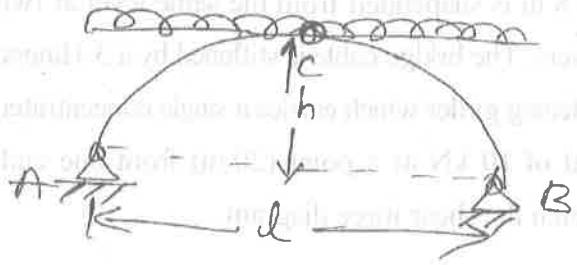


Fig.15

(c) A 3-hinged parabolic arch of 20 meter span and 4 m central rise carries a point load of 4 kN at 4 m horizontally from the left hand hinge calculate the normal thrust and shear force at the section under the load. Calculate the max. (+ve) and (–ve) bending moment shown in fig. (16). 7

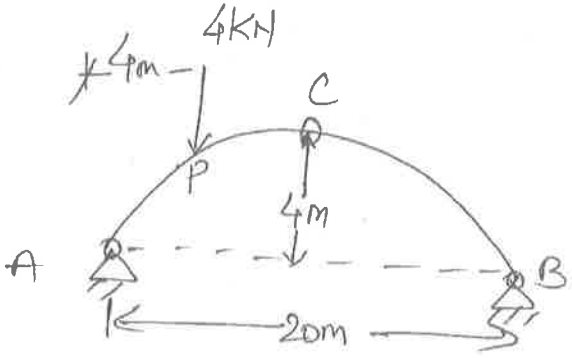


Fig.16

(d) A suspension bridge cable of span 80 m and central

dip 8 m is suspended from the same level at two towers. The bridge cable is stiffened by a 3-Hinged stiffening girder which carries a single concentrated load of 10 kN at a point (20 m) from one end. Sketch the shear force diagram.