IX A symmetrical 3-hinged semi-circular arch has a radius of 8m. The arch is loaded with 20 kN/m for the whole span. Find:

(i) Support reactions

(ii) Bending moment, shear force and axial thrust at 1/4 span.

(iii) Magnitude and location of maximum bending moment.

OR

X A symmetrical two-hinged parabolic arch has a span of 36m and central rise of 8m. It is loaded with 40 kN/m udl over the left half of the span.

Calculate:

(i) Reactions at support

(ii) Bending moment, shear force and axial thrust at 9m from left support.

(iii) Location and magnitude of maximum Bending Moment.

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BTS 020(C)

B.Tech. Degree IV Semester Examination, July 2001

CE 403 ANALYSIS OF STRUCTURES - I

Time: 3 Hours *Max. marks: 100*

(All questions carry equal marks)

I a) Define strain energy. Derive an expression for strain energy due to bending in a flexural members.

b) A frame shown in Fig. 1 consists of a column AB fixed at A and having rigid connection at B with a double cantilever. EI is constant throughout. Calculate the vertical deflection at C and D.

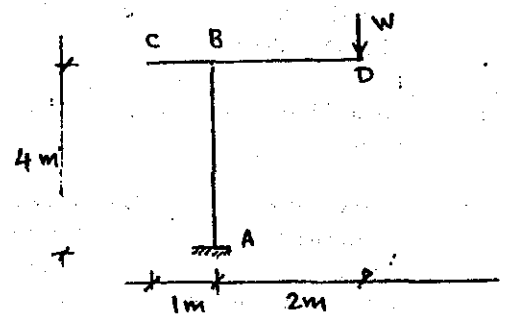

Fig.1

OR

II a) Explain the principle of virtual work on a rigid body and on an elastic body.

b) For the truss shown in Fig.2, calculate the vertical deflection at D. AE = 8 x 10^4 kN is constant for all members.

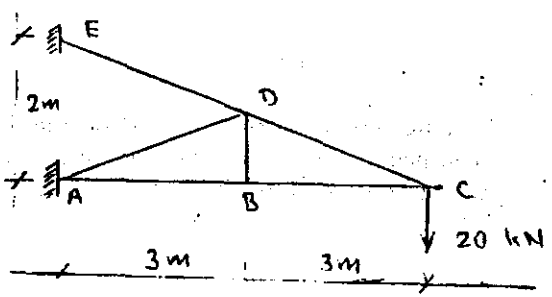

Fig.2

(P.T.O)

III a) State the two theorems associated with finding the location of the point of maximum Bending moment on a simply supported beam with a number of point loads moving.

b) Five point loads 120 kN, 15 kN, 15 kN, 100 kN and 50 kN separated by distance of 2m between the successive loads cross a simply supported beam of span 25m. Calculate

(i) maximum bending moment at a section 9m from the left end.

(ii) location and magnitude of the absolute maximum bending moment in the beam.

Consider the movement of loads in either direction with 120 kN in the lead.

OR

IV a) State Muller - Breslau's principle and explain its significance.

b) Draw influence line for bending moment at B and vertical reaction at A in the beam shown in Fig.3. Find their maximum value due to a load of 60 kN/m that may occupy any part of the beam.

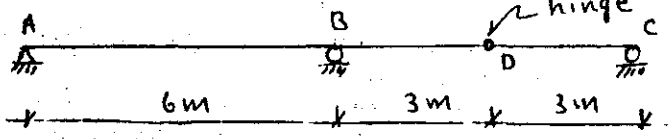

Fig.3

V a) Draw the curves of maximum shear force and bending moment in a simply supported beam when a uniformily distributed load shorter than the span crosses the beam.

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b) For the beam ABC shown below in Fig.4, obtain the equation of influence line diagram for bending moment at A and B.

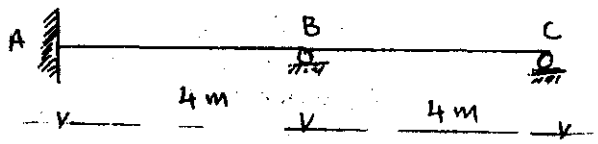

Fig. 4

OR

VI Draw influence line for forces in members (1), (2) and (3) in the truss in Fig.5. Find their maximum value due to three point loads 8 kN, 8 kN and 4 kN separated by distance 2m and 3m respectively. The loads can traverse in either directions.

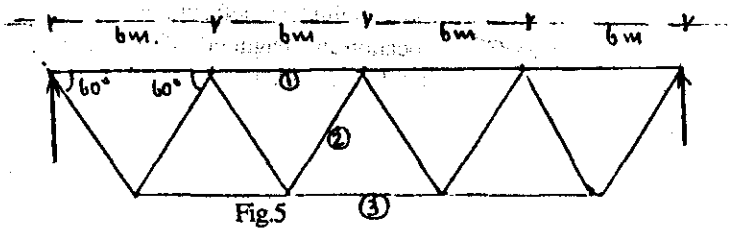

Fig.5

VII The tower of 150m span suspension bridge are of unequal heights. One is 20m and other is 5m above the lowest point of the cable which is immediately above the inner hinge of a 3-hinged stiffening girder. Find the maximum tension in the cable; due to a point load of 100 kN crossing the bridge.

OR

VIII A bridge cable slung between two piers 80m apart carries a load of 30 kN/m. The supports of the piers are at same level and the cable at its lowest point sags 8m below this level. Calculate the maximum value of cable tension. Also calculate the tension in the back stay and the vertical load on the piers if the cable passes over saddles and the back stay is inclined at 30° to horizontal. If the cable passes over a smooth pulley find the horizontal and vertical forces on the pier.

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