Printed Pages: 05 **Sub Code: RCE403**

Paper Id: **100256** **Roll No.** | | | | | | | | | | |

B.TECH.
(SEM IV) THEORY EXAMINATION 2018-19
STRUCTURAL ANALYSIS-I

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If you require any missing data, choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 7 = 14**

a. Explain degree of freedom of a structure.
b. Give an example for a structure which is externally as well as internally indeterminate.
c. State Maxwell's law of reciprocal deflections.
d. Give an expression for strain energy stored in a beam due to bending.
e. List the assumptions made in truss analysis.
f. What is the shape of the influence line diagram for maximum bending moment in a simply supported beam?
g. State Eddy's theorem.

SECTION B

2. Attempt any *three* of the following: **7 x 3 = 21**

a) Determine the forces in the members by method of joints. See Fig.1

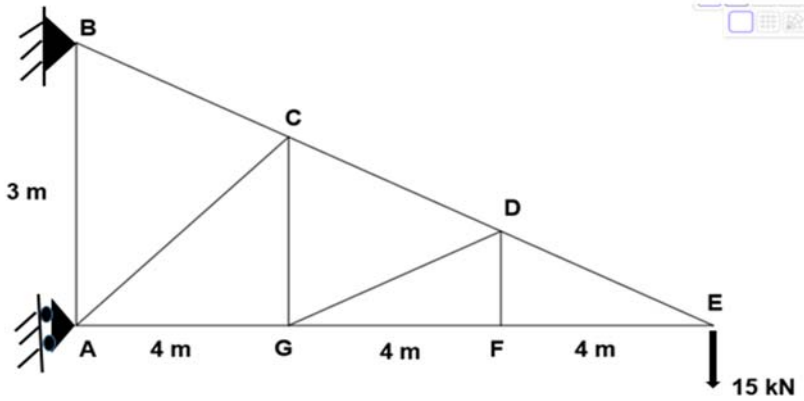

Fig.1

b) Three hinged parabolic arch of span 10 m and central rise 2.5 m supports a point load of 100 KN at left quarter span and a UDL of 20 KN/m over the right half of the span. See fig.2.
a) Draw the influence line diagram.
b) Determine the reactions, normal thrust and radial shear at right quarter span point.

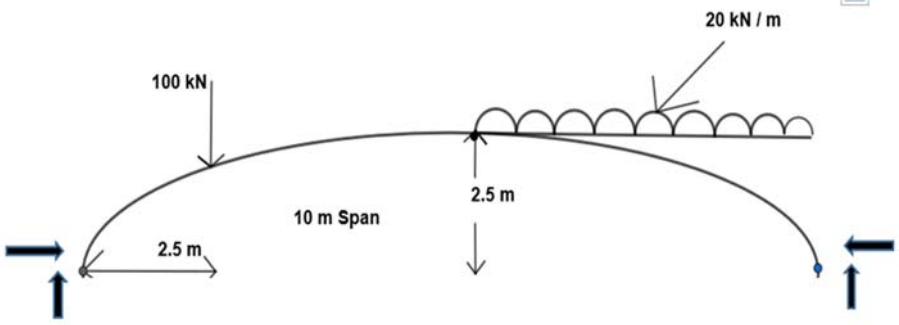

Fig.2

c) A train of four concentrated loads crosses a simply supported girder of 10 m span with 30 kN leading. See fig3. Determine
   I. The maximum bending moment at 6 m from the left support.
   II. Absolute maximum bending moment anywhere in the girder.

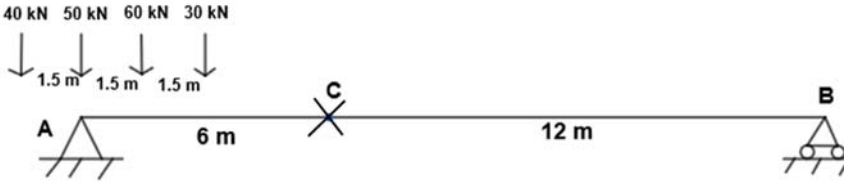

Fig.3

d) State and prove Betti's law.

e) A cord supported at its ends 60 m apart carries loads of 30 kN, 15 kN, 18 kN at 15, 30 and 45 m respectively from the left end. If the point on the cord where the 15 kN load is supported is 15 m below the level of end supports determine.
   I. The reactions at the supports,
   II. Tension in different parts of the cord
   III. The total length of the cord.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

a) Find static indeterminacy and kinematic indeterminacy of the given structure. See fig.4.

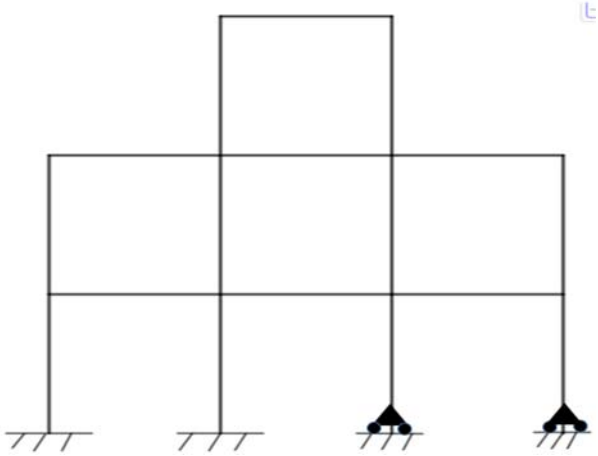

Fig.4

b) Find static indeterminacy and kinematic indeterminacy of the given structure. See fig5.

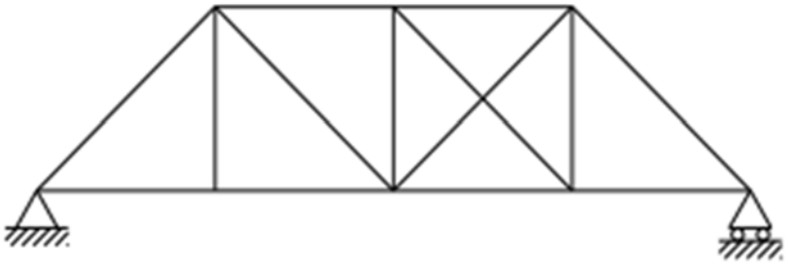

Fig.5

4. Attempt any *one* part of the following: 7 x 1 = 7

a) Determine the forces in all the members using method of substitution, for the below given Fig.6

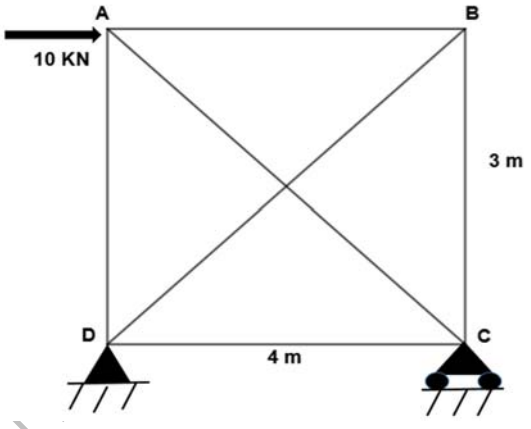

Fig.6

b) The Fig.7 shows a warren type cantilever truss along with the imposed loads. Determine the forces in all the members using tension coefficients.

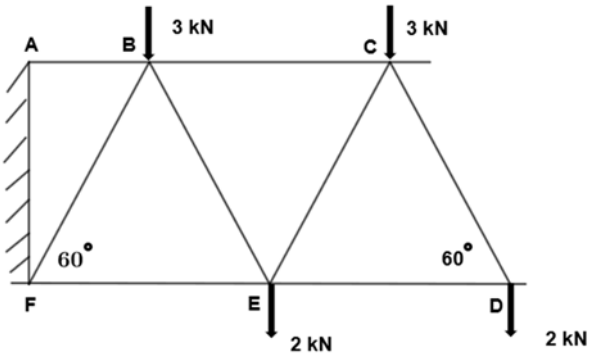

Fig.7

5. Attempt any *one* part of the following: 7 x 1 = 7

a) A beam ABCD is simply supported at its ends A and D over a span of 30 m. It is made three portions AB, BC and CD each 10 m in length. The moment of inertia of the section of these lines are I, 3I and 2I respectively. The beam carries a point load 150 KN at B and point load of 300 KN at C. neglecting the weight of the beam calculate the slopes and deflection at A, B, C and D

Where E = **200 kN/mm^2, I = 2 × 10^{10} mm^4.**

b) Find the horizontal movement of the roller end D of the portal frame shown in Fig.8 Take E = 2 × 10^8 kN/m^2 and I = 3 × 10^4 m^4. The moment of inertia of the column section is I while that of beam is 2I.

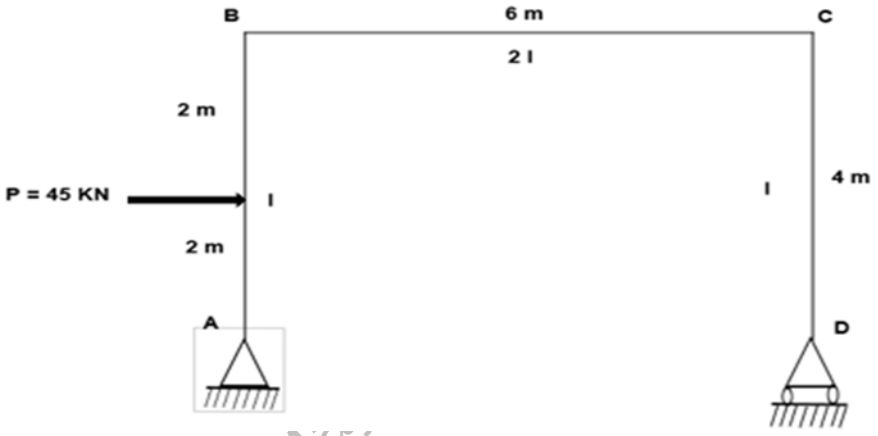

Fig.8

6. Attempt any *one* part of the following: 7 x 1 = 7

a) By using Muller – Breslau's principle Construct influence line diagram for the beam as shown in Fig 9.

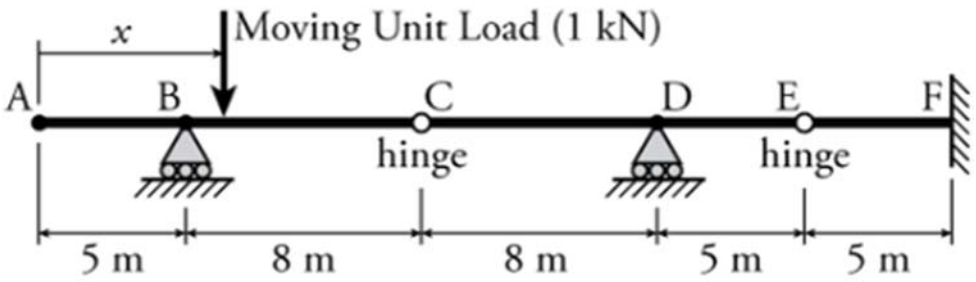

Fig.9

b) Assume a unit point load is rolling along the bridge deck from points A to D in a simple truss as shown in Fig.10. The distance X is the distance of the moving load from point A. Construct the influence line diagram for the three members EF, BF and BC.

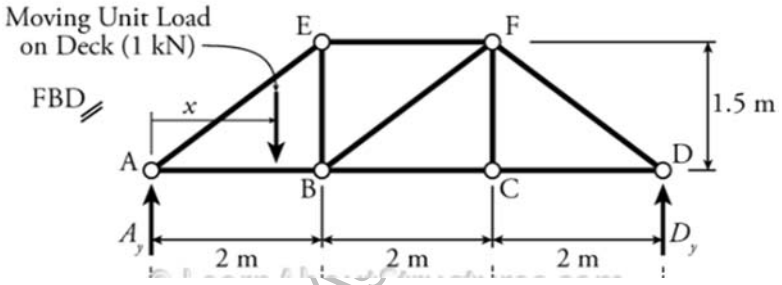

Fig.10

7. Attempt any *one* part of the following: 7 x 1 = 7

a) A three hinged parabolic arch of span 30 m and central rise of 5m. It is subjected to a concentrated load of 40 KN at 6 m span. Calculate the normal thrust, shear force and bending moment at 6 m from the left support. See fig.11.

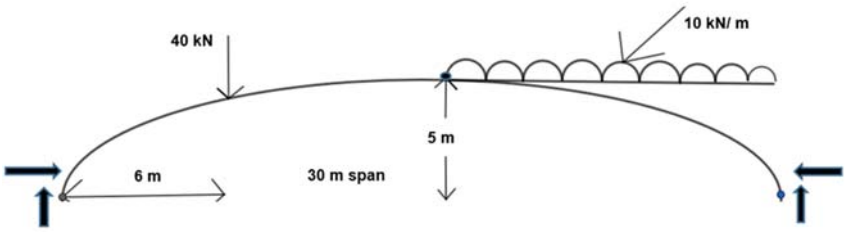

Fig.11

b) Classify the arches based on materials, shapes and structural systems with the help of neat sketch. Also, distinguish between two hinged and three hinged arches.