BTECH
(SEM-5) STRUCTURAL ANALYSIS 2021-22

TIME:3 HOUR   *Total Marks: 100*
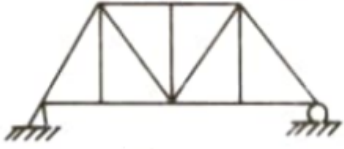
Instruction: Attempt the questions as per the given instructions. Assume missing data suitably.

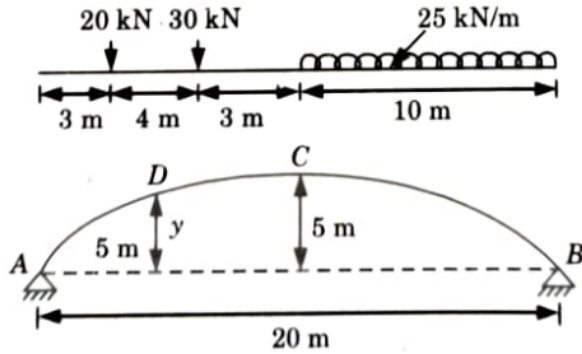| SECTION - A		
Attempt *All Parts* in Brief		**2*10 = 20**
Q1	**Questions**	**Marks**
(a)	Differentiate between determinate and indeterminate structures with example.	2
(b)	Determine the degree of kinematic indeterminacy for plane truss structure as shown in the Fig.	2
(c)	With figure illustrate the classification of plane truss.	2
(d)	State the differences between a perfect truss and an imperfect truss.	2
(e)	State the Betti's law with proper expression.	2
(f)	What is the importance of influence line diagram ?	2
(g)	Define Muller-Breslau's principal.	2
(h)	What is radial shear and normal thrust in a three hinge arch ?	2
(i)	Define Eddy's theorem.	2

SECTION - B

Attempt _Any Three_ of the following   **3*10 = 30**

Q2	Questions	Marks
(a)	Calculate the support reactions and vertical sag at B wrt A. Member CD is rigid and horizontal.	10
(b)	Determine the forces in the members of the Warren truss as shown in Figure by using method of joints. All members are 1 m long.	10
(c)	Determine the deflection of beam at the free end by using unit load method.	10
(d)	Find the shear force and bending moment at point X and also draw influence line diagram.	10

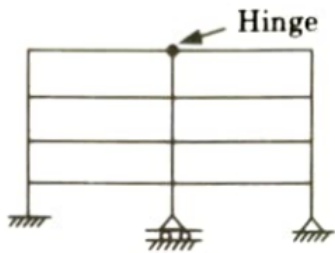| (e)	A parabolic three hinged arch carries load as shown in the figure. Determine the resultant reactions at support. Find the bending moment, normal thrust and radial shear at a distance of 5 m from A.	10

20 kN 30 kN   25 kN/m

3 m   4 m   3 m   10 m

D   C

5 m y   5 m

A   B

5 m

20 m

Attempt _Any One_ of the following   **5*10 = 50**
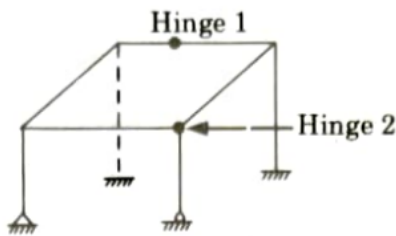
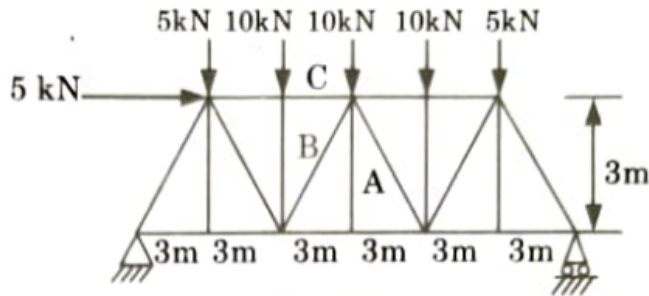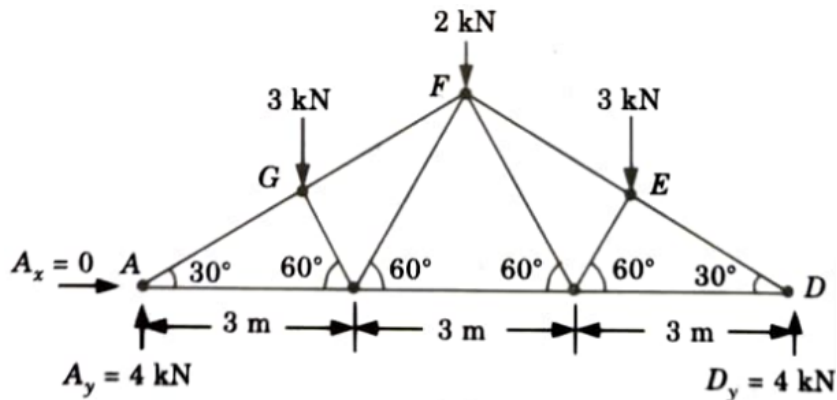| Q3	Questions	Marks
(a)	Find the static and kinematic indeterminacy of the structure as shown in the Fig. Hinge	10
(b)	Find the static and kinematic indeterminacy of the structure as shown in the Fig. Hinge 1 Hinge 2	10

Q4	Questions	Marks
(a)	By using method of sections calculate forces at member A, B and C.	10

| (b)	Determine the force in each member of the roof truss as shown. State whether the member are in tension or compression.	10

| **Q5**	**Questions**	**Marks**
(a)	A continuous beam of two equal spans "L" is uniformly loaded over its entire length. Find the magnitude "R" of the middle reaction by using Castigliano's theorem.	10
(b)	Find slope at A and maximum deflection in the beam shown below by using conjugate beam method.	10
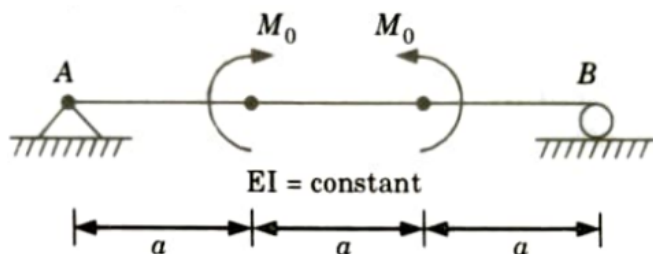
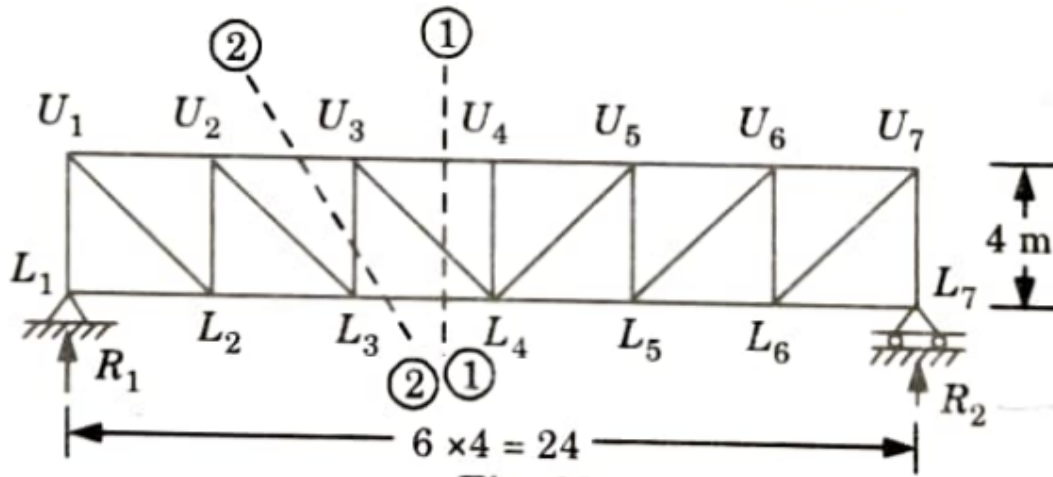| **Q6**	**Questions**	**Marks**
(a)	A train of four concentrated loads moves from left to right on a simply supported girder of span 16 m. Draw ILD for absolute maximum positive shear force, absolute maximum negative shear force and absolute maximum bending moment. Also calculate the values.	10

40 kN   30 kN 50 kN 10 kN

A   B
|← 16 m →|

3m   2m   2m
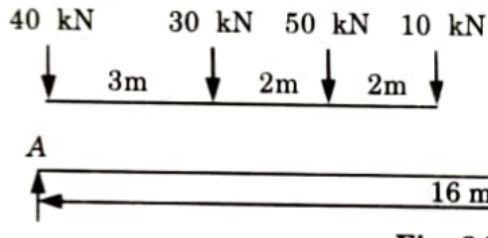
| (b) | Draw the influence line diagram for forces in the members U_3L_4, U_3U_4 and U_3L_4 of the frame as shown in the Fig. Find the maximum forces developed, when uniformly distributed load of intensity 40 kN/m, longer than the span moves from left to right on bottom chord. | 10 |

U_1 U_2 U_3 U_4 U_5 U_6 U_7

L_1 L_7 4 m

R_1 L_2 L_3 L_4 L_5 L_6 R_2

6 ×4 = 24

Q7	Questions	Marks
(a)	A symmetric three-hinged parabolic arch has a span of 30 m and a central rise of 6 m. The arch carries a distributed load which varies uniformly from 40 kN/m at each abutment to zero at mid-span. Determine: i. The horizontal thrust at the abutments. ii. Maximum positive bending moment in the arch.	10
(b)	Prove that the parabolic shape is a funicular shape for a three-hinged arch subjected to a uniformly distributed load over to its entire span.	10