Hall Ticket No | | | | | | | | | | | Question Paper Code: ACE008

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER- I

B.Tech V Semester End Examinations, November- 2019

Regulations: R16

STRUCTURAL ANALYSIS

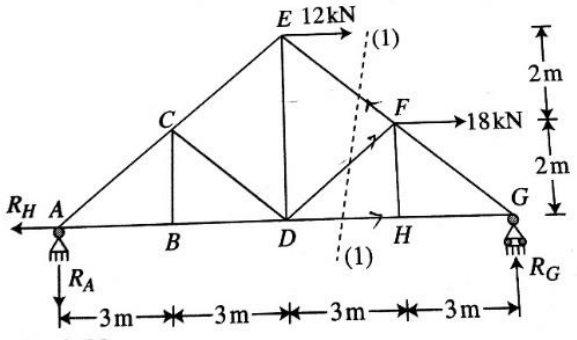
(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

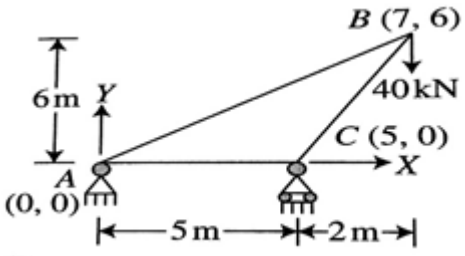
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT– I

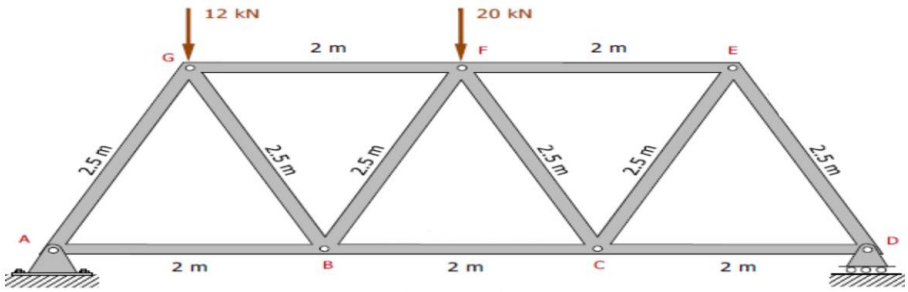
1. a) Determine the forces in the bars EF, DF and DH of the truss as shown in figure below by using method of sections. **[7M]**



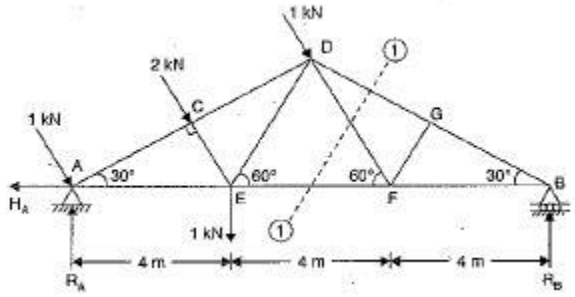
b) Evaluate the forces in all the bars of the truss as shown in the figure by using tension coefficient method. **[7M]**



2. a) The structure in Figure is a truss which is pinned to the floor at point A, and supported by a roller at point D. Determine the force to all members of the truss. **[7M]**



b) A truss of 12m span is loaded as shown in figure. Determine the forces in members DG, DF and EF using method of section. **[7M]**



UNIT – II

3. a) Write the expression for the horizontal thrust of a two-hinged arch under the effects of temperature, rib-shortening and support-yielding? Explain the effects of each on the horizontal thrust. **[7M]**

b) A three hinged arch parabolic arch ABC has a span of 20m and central rise of 4m. The arch has hinges at the ends and at the center. A train of two point loads of 20Kn and 10Kn, 5m apart, crosses this arch from left to right, with 20Kn load leading. Calculate maximum thrust induced at the support. **[7M]**

4. a) A three-hinged segmental arch has a span of 40m and a rise of 7m. It is subjected to a load of 80KN acting at 10m from the left support. Find **[7M]**
   a. The horizontal thrust and vertical reaction at supports.
   b. Normal thrust, radial shear and bending moment at 10m from the left support.

b) Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 15 m subjected to a uniformly distributed load of 5 kN/m throughout the span and a concentrated load of 10 kN at the crown. Take EI as constant. **[7M]**

UNIT – III

5. a) A cantilever of length 8m carries UDL of 2kN/m run over the whole length. The cantilever is propped rigidly at the free end. If $E=1X10^5 N/mm^2$ and $I=10^8$ mm^4, then determine reaction at the rigid prop and deflection at the center. **[7M]**

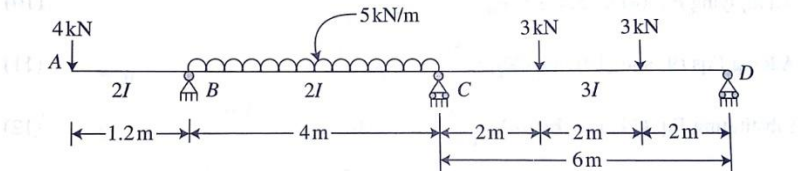
b) A fixed beam of length 6m carries point loads of 20 kN and 15kN at distance 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F diagrams. **[7M]**

6. a) A continuous beam ABC covers two consecutive spans AB and BC of lengths 4 m and 6 m, carrying uniformly distributed loads of 6 kN/m and 10 kN/m respectively. If the ends A and C are simply supported find the support moments at A, B and C. Draw bending moment diagram. **[7M]**

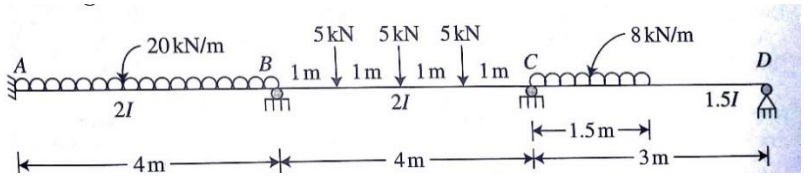
b) A continuous beam ABC of length 5L consists of spans AB and BC of lengths 3L and 2L respectively. The beam carries UDL of W per unit run on the whole beam. Determine the bending moments and reactions and draw BMD. **[7M]**

UNIT – IV

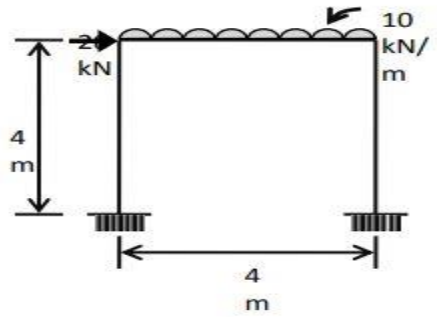
7. a) Analyse the continuous beam shown in figure by slope deflection method. **[7M]**



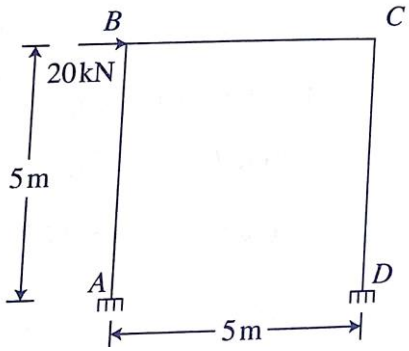
b) Using moment distribution methods, determine the end moments in the three span continuous beam as shown in the figure. **[7M]**



8. a) Carry out the non-sway analysis for the following frame by Moment Distribution Method, and draw the bending moment diagram. Assume constant EI for all members. **[7M]**

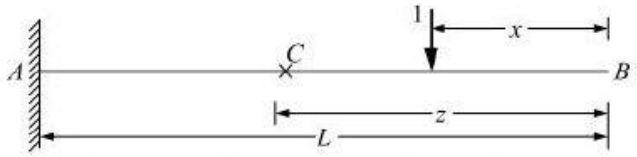


b) Analyse the frame shown in figure by slope deflection equations assume EI to be constant. Draw SFD and BMD. **[7M]**

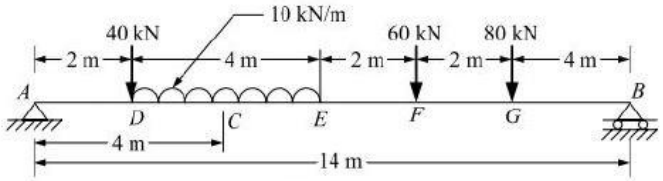


UNIT – V

9. a) Draw the influence line diagram for shear force and bending moment for a cantilever beam at point A which is fixed and at a section C along the span length. Let the unit load acts at a distance x from the free end B. **[7M]**



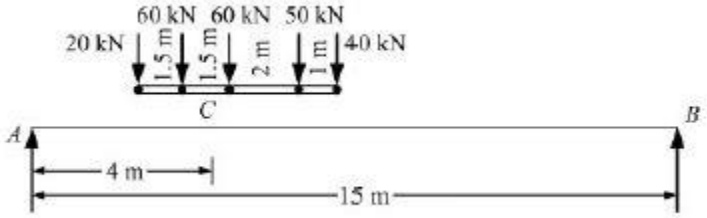
b) Using influence line diagram determine the shear force and bending moment at section C in the simply supported beam as shown in the figure. **[7M]**



10. a) Draw the influence line diagram for the given over hanging beam. **[7M]**

b) The system of concentrated loads as shown in the figure below rolls from left to right on the girder span 15m, 40kN load lending. For a section 4m from left support, determine **[7M]**

a. Maximum bending moment
b. Maximum shear force



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COURSE OBJECTIVES:

The course should enable the students to:

I	Describe the process of analysis of various structures such as beams, trusses, arches and frames.
II	Analyze statically determinate structures using force and displacement methods.
III	Draw the shear force, bending moment and influence diagrams for various structures.
IV	Examine the various structures to calculate critical stresses and deformation.

COURSE OUTCOMES (COs):

CO 1	Understand the concept of trusses and describe the analysis process of trusses by various methods.
CO 2	Determine stresses and analysis of two hinged and three hinged arches..
CO 3	Evaluate propped cantilever, fixed beam and continuous beam using various methods of analysis.
CO 4	Understand the concept of moment distribution method and its application to beams and frame structure.
CO 5	Comprehend the concept of moving loads and influence line diagram, its application to beams.

COURSE LEARNING OUTCOMES (CLOs):

CLO 1	Differentiate between the perfect, imperfect and redundant pin jointed frames.
CLO 2	Identify the pin jointed frames and rigid joint structures.
CLO 3	Understand the determinate and indeterminate structures for rigid jointed and pin jointed frames.
CLO 4	Analysis of determinate pin jointed frames using method of joint, method of section for vertical load.
CLO 5	Evaluate the determinate pin jointed frames by method of joint, method of section for horizontal and inclined load.
CLO 6	Analysis of determinate pin jointed frames by tension coefficient method foe vertical, horizontal and inclined loads.
CLO 7	Differentiate between three hinged and two hinged arches.
CLO 8	Analysis of three hinged circular arches at different levels.
CLO 9	Execute secondary stresses in two hinged arches due to temperature and elastic shortening of rib.
CLO 10	Analyze the parabolic arches for the shear forces and bending moments.
CLO 11	Evaluate the shear forces and bending moments in two-hinged arches using energy methods.
CLO 12	Draw the shear forces and bending moments in three hinged arches using energy methods.
CLO 13	Derive the moment equation for propped cantilever and fixed beams under various conditions
CLO 14	Analysis of propped cantilever and fixed beam using the method of consistent deformation for different loading conditions.
CLO 15	Evaluate of continuous beam using the method of clapeyron's equation of three moment.
CLO 16	Analysis of continuous beam with sinking support using equation of three moments.
CLO 17	Contrast between the concept of force and displacement methods of analysis ofindeterminate structures.
CLO 18	Analyze the methods of moment distribution to carry out structural analysis of 2D portal frames with various loads and boundary conditions.

CLO 19	Apply the methods of slope deflection to carry out structural analysis of 2D portal frames with various loads and boundary conditions.
CLO 20	Analysis of single storey frames with and without sway using slope deflection and moment distribution method.
CLO 21	Comprehend the concept of moving loads, and its effect on shear force and bending moment on a beam.
CLO 22	Evaluate the shear force and bending moment at a section of a determinate beam under moving load.
CLO 23	Understand the concept of influence line diagram for shear force and bending moment.
CLO 24	Construct the influence line diagram for shear forceand bending movement for the entire beam.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	ACE008.04	Analysis of determinate pin jointed frames using method of joint, method of section for vertical load.	CO 1	Understand
	b	ACE008.05	Analysis of determinate pin jointed frames by tension coefficient method foe vertical, horizontal and inclined loads.	CO 1	Understand
2	a	ACE008.05	Evaluate the determinate pin jointed frames by method of joint, method of section for horizontal and inclined load.	CO 1	Understand
	b	ACE008.05	Analysis of determinate pin jointed frames by tension coefficient method foe vertical, horizontal and inclined loads.	CO 1	Understand
3	a	ACE008.09	Execute secondary stresses in two hinged arches due to temperature and elastic shortening of rib.	CO 2	Understand
	b	ACE008.10	Analyze the parabolic arches for the shear forces and bending moments.	CO 2	Remember
4	a	ACE008.12	Draw the shear forces and bending moments in three hinged arches using energy methods.	CO 2	Understand
	b	ACE008.9	Execute secondary stresses in two hinged arches due to temperature and elastic shortening of rib.	CO 2	Understand
5	a	ACE008.14	Analysis of propped cantilever and fixed beam using the method of consistent deformation for different loading conditions.	CO 3	Understand
	b	ACE008.13	Derive the moment equation for propped cantilever and fixed beams under various conditions	CO 3	Understand
6	a	ACE008.15	Evaluate of continuous beam using the method of clapeyron's equation of three moment.	CO 3	Understand
	b	ACE008.16	Analysis of continuous beam with sinking support using equation of three moments.	CO 3	Understand
7	a	ACE008.18	Analyze the methods of moment distribution to carry out structural analysis of 2D portal frames with various loads and boundary conditions.	CO 4	Understand
	b	ACE008.20	Analysis of single storey frames with and without sway using slope deflection and moment distribution method.	CO 4	Understand
8	a	ACE008.19	Apply the methods of slope deflection to carry out structural analysis of 2D portal frames with various loads and boundary conditions.	CO 4	Understand
	b	ACE008.20	Analysis of single storey frames with and without sway using slope deflection and moment distribution method.	CO 4	Understand

9	A	ACE008.24	Construct the influence line diagram for shear forceand bending movement for the entire beam.	CO 5	Understand
	b	ACE008.23	Understand the concept of influence line diagram for shear force and bending moment.	CO 5	Understand
10	a	ACE008.23	Understand the concept of influence line diagram for shear force and bending moment.	CO 5	Understand
	b	ACE008.22	Evaluate the shear force and bending moment at a section of a determinate beam under moving load.	CO 5	Understand

Signature of Course Coordinator **HOD, CE**