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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER-II

B.TechV Semester End Examinations, November- 2019

Regulations: R16

STRUCTURAL ANALYSIS

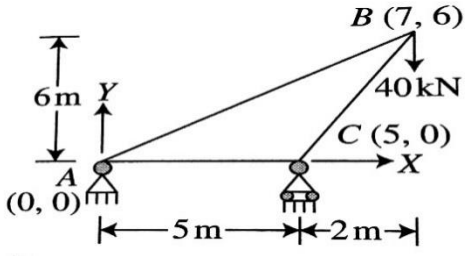
(Civil Engineering)

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

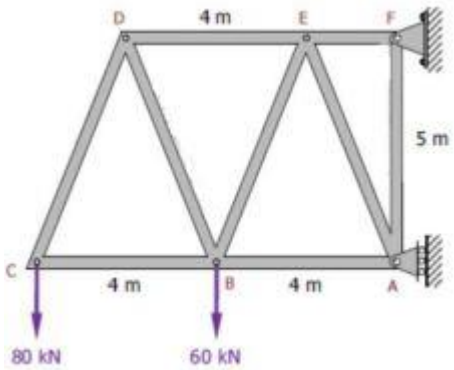
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT– I

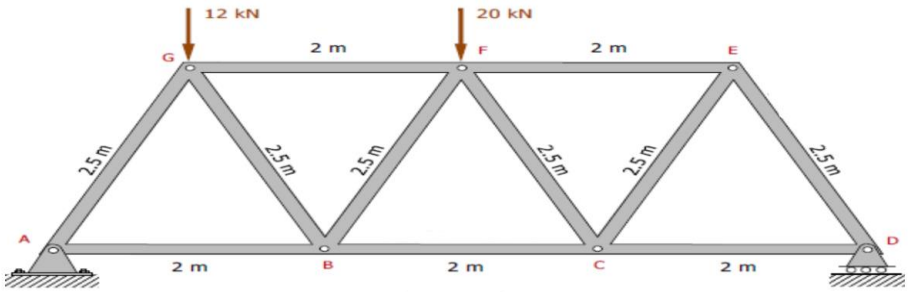
1. a) Evaluate the forces in all the bars of the truss as shown in the figure by using tension coefficient method. **[7M]**



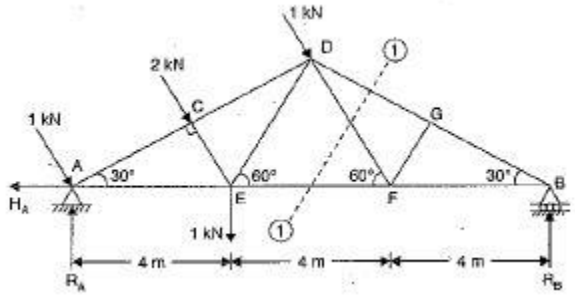
b) Find the force acting in all members of the truss shown in Figure by using method of joints. **[7M]**



2. a) The cantilever truss in Figure is hinged at D and E. Find the force in each member using method of tension coefficient. **[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) A three hinged semicircular arch of radius R carries a uniformly distributed load W per unit run over the whole span. Derive the expression for horizontal thrust. **[7M]**

b) A three hinged arch parabolic arch ABC has a span of 25m and central rise of 5m. The arch has hinges at the ends and at the center. A train of two point loads of 22Kn and 11Kn, 4m apart, crosses this arch from left to right, with 22Kn load leading. Calculate maximum thrust induced at the support. **[7M]**

4. a) A three-hinged segmental arch has a span of 30m and a rise of 6m. It is subjected to a load of 60KN acting at 11m from the left support. Find **[7M]**
   a. The horizontal thrust and vertical reaction at supports.
   b. Normal thrust, radial shear and bending moment at 11m from the left support.

b) Determine the horizontal thrust developed in a two-hinged semi-circular arch of radius 20 m subjected to a uniformly distributed load of 4kN/m throughout the span and a concentrated load of 15kN at the crown. Take EI as constant. **[7M]**

UNIT – III

5. a) A cantilever of length 10m carries UDL of 2.5kN/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]**

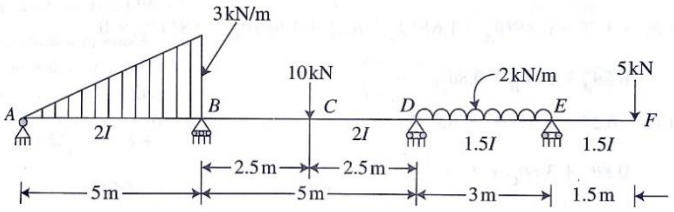
b) A fixed beam of length 6m carries point loads of 25kN and 20kN at distance 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F diagrams. **[7M]**

6. a) A continuous beam ABC covers two consecutive spans AB and BC of lengths 5 m and 6 m, carrying uniformly distributed loads of 5kN/m and 12kN/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]**

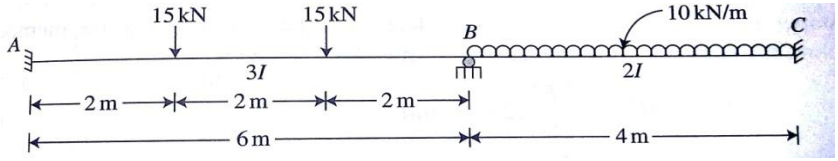
b) A continuous beam ABC of length 6L consists of spans AB and BC of lengths 2L and 4L respectively. The beam carries UDL of 'w' per unit run on the whole beam. Determine the bending moments and reactions and draw BMD. **[7M]**

UNIT – IV

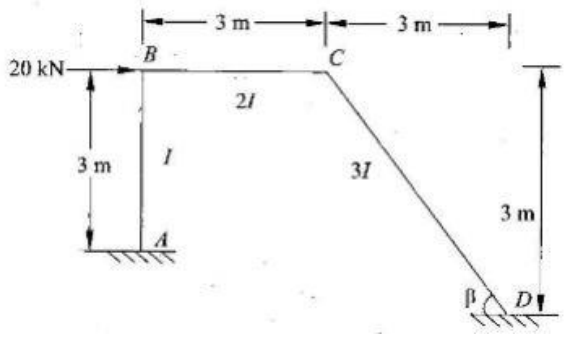
7. a) Analyse the continuous beam shown in figure by slope deflection method. **[7M]**



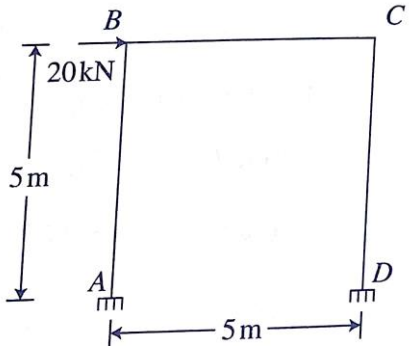
b) Using moment distribution methods, determine the end moments in the three span continuous beam as shown in the figure. **[7M]**



8. a) Analyze the frame shown in the below figure by moment distribution method and sketch bending moment diagram. **[7M]**

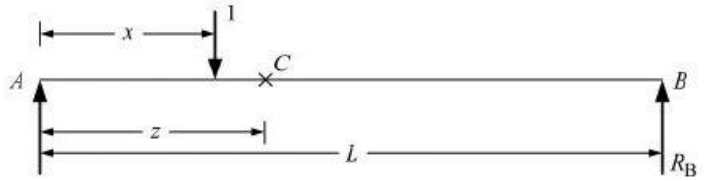


b) Analyse the frame shown in figure by slope deflection equations assume EI to be constant. Draw SFD and BMD. **[7M]**

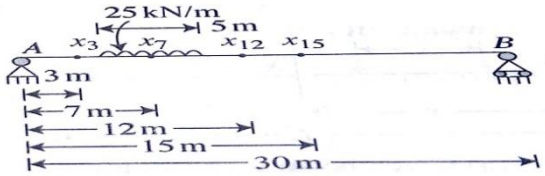


UNIT – V

9. a) Draw the influence line diagram for a Simply supported beam AB with span length L, and carries a unit load at a distance x from left support A. **[7M]**

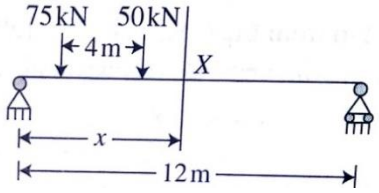


b) A UDL of length 5m and intensity 25kN/m moves across a simple beam of span 30m. Determine the maximum negative and positive SF and maximum BM at sections 3m, 7m, 12m from the left support and also the absolute maximum shear force and bending moment. Draw the maximum SFD and BMD. **[7M]**



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

b) Two concentrated loads of 50kN and 75 kN separated by 4m across a beam of 12m span from left to right with 50kN load lending the train. Draw the maximum SFD and BMD. Also, locate the position and calculate the magnitude of the absolute maximum BM. **[7M]**



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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, its effect on shear force and bending moment on a beam.
CLO 22	Evaluate 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	ACE008.06	Analysis of determinate pin jointed frames using method of joint, method of section for vertical load	CO 1	Understand
	b	ACE008.04	Analysis of determinate pin jointed frames using method of joint, method of section for vertical load.	CO 1	Understand
2	a	ACE008.06	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
3	a	ACE008.08	Analysis of three hinged circular arches at different levels.	CO 2	Understand
	b	ACE008.10	Analyze the parabolic arches for the shear forces and bending moments.	CO 2	Remember
4	a	ACE008.11	Draw the shear forces and bending moments in three hinged arches using energy methods.	CO 2	Understand
	b	ACE008.08	Analysis of three hinged circular arches at different levels.	CO 2	Understand
5	a	ACE008.13	Derive the moment equation for propped cantilever and fixed beams under various conditions	CO 3	Understand
	b	ACE008.14	Analysis of propped cantilever and fixed beam using the method of consistent deformation for different loading 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	ACE008.19	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	ACE008.18	Analyze the methods of moment distribution to carry out structural analysis of 2D portal frames with various loads and boundary conditions.	CO 4	Understand
8	a	ACE008.20	Analysis of single storey frames with and without sway using slope deflection and moment distribution method.	CO 4	Understand
	b	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
9	a	ACE008.24	Construct the influence line diagram for shear forceand bending movement for the entire beam.	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
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**