Hall Ticket No | | | | | | | | | | | Question Paper Code: ACE016

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER

B. Tech VII Semester End Examinations, November - 2019

Regulations: R16

ADVACED STRUCTURAL ANALYSIS AND DESIGN

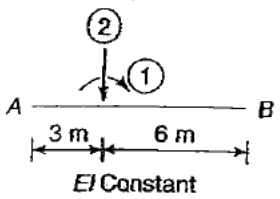
(CIVIL ENGINEERING)

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

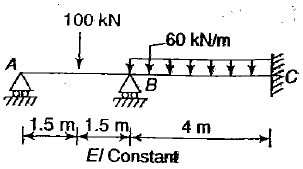
Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. a) Develop the stiffness matrix for a prismatic member AB with reference to the coordinates shown in figure with fixed supports at A and B. **[7M]**

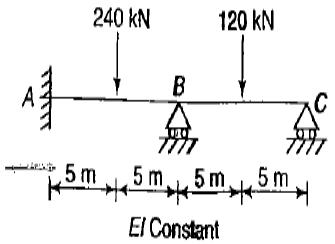


b) Analyze the continuous beam shown in figure using flexibility method. **[7M]**



2. a) What is relationship between stiffness matrix and flexibility matrix. **[7M]**

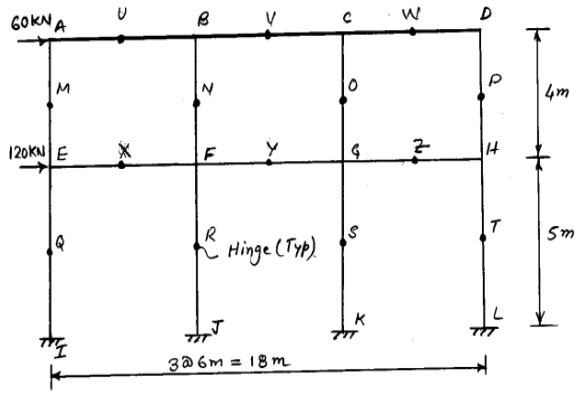
b) Analyze the continuous beam shown in figure using stiffness method. **[7M]**



UNIT – II

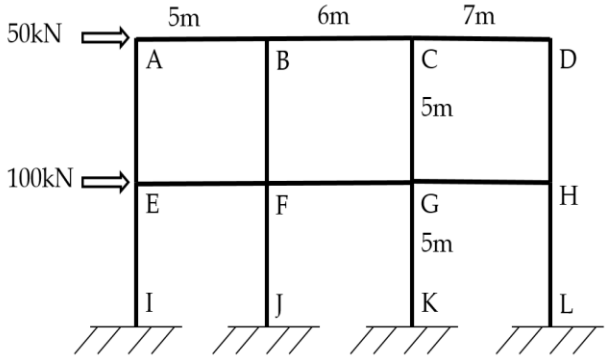
3. a) Write the assumptions made for the analysis of frame for horizontal loads using portal method and cantilever method. **[7M]**

   b) Analyze the frame using portal method. **[7M]**



4. a) Explain the approximate method for analysis of portal frames, in case of stiff girders and state the assumptions. **[7M]**

   b) Analyze the frame using cantilever method. The area of columns are 2A, 1.25 A, 1.5A and A respectively. **[7M]**



UNIT – III

5. a) What is the purpose of a retaining wall? List and sketch the different types of retaining walls encountered in practice. **[7M]**

   b) Design a counterfort-type retaining wall to retain a 6.8 m high backfill above the ground level. The unit weight and SBC of the soil at site are 18 kN/m^3 and 170 kN/m^2, respectively. The angle of internal friction of soil and coefficient of friction are 30^o and 0.6, respectively. The exposure condition is moderate. **[7M]**

6. a) What is meant by surcharge? How is it considered in earth pressure calculations? **[7M]**

   b) Design a circular tank with flexible base for a capacity of 500000 litres. The depth of water is to be 5m, including a free board of 250mm. Use M20 concrete. **[7M]**

UNIT – IV

7.	a)	In what way does the reinforcement detailing of driven precast concrete piles differ from other types of piles?	**[7M]**
	b)	Design a precast pile of diameter 300 mm carrying an axial load of 250 kN, placed in submerged medium dense sandy soil having an angle of internal friction of 30^O. The density of soil is 17.5 kN/ m^3 and the submerged density of soil is 10 kN/m^3.Angle of wall friction between concrete pile and soil, d is 0.75f =23^O. Assume the following data: Depth of top of pile cap below ground level is 500 mm, thickness of pile cap is 1.5 m, grade of concrete in pile is M25, Fe 415 steel is used, and clear cover to reinforcement is 75 mm. Determine the vertical carrying capacity of the pile in accordance with IS 2911 (Part 1, Section 1) and design the pile.	**[7M]**
8.	a)	What are the different types of deep foundation explain with sketches.	**[7M]**
	b)	Design the interior panel of a flat slab 7.6mX6.6m in size, for a superimposed load of 8.75kN/m^2. Provide two way reinforcement. Use M20 and Fe415 steel.	**[7M]**

UNIT – V

9.	a)	Explain briefly about the forces acting on steel chimney.	**[7M]**
	b)	Design a chimney of 60m height, having external diameter of 4m throughout the height. The chimney has fire brick lining of 120mm thickness, provided up to a height of 40m above ground level, with an air gap of 100mm. The temperature of gases above surrounding air is 250^OC. Take coefficient of expansion of concrete and steel = 11X10-6 / ^{O}C, and Es=2.05X10^5MPa. Use M25 grade of concrete.	**[7M]**
10.	a)	Design a bunker of size 8m length X 4m width. It has 3m depth vertical plate and height of trough is 4m. Use coal for storing.	**[7M]**
	b)	Design a bunker to store 500kN of coal, for the following data: Unit weight of coal = 8.34kN/m^3; Angle of repose = 35^O. The stored coal is to be surcharged at its angle of repose. Take permissible stress in steel as 140N/mm^2.	**[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

I	Enhance knowledge of matrix stiffness and flexibility methods for analyzing continuous beams, portal frames and trusses.
II	Design advanced structures such as retaining walls against lateral earth pressure.
III	Analyze and design the different types of piles and flat slabs as per the recommendations of Indian Standard codes.
IV	Explore and interpret the basic design concepts of water tanks, silos and bunkers.

COURSE OUTCOMES (COs):

CO 1	Understand the basic concepts of static and kinematic indeterminacy. Know the concepts of stiffness method and flexibility method and analysis of various structural elements using these methods.
CO 2	Understand the concepts of different approximate methods of analysis for lateral loads. Analysis of multi storey frame using portal method, cantilever method and substitute frame method.
CO 3	Know the design concepts and IS code provisions for the retaining walls and water tanks. Design retaining walls and water tanks.
CO 4	Know the design concepts and IS code provisions for the flat slabs and deep foundations. Design of flat slab, raft foundation and pile foundation.
CO 5	Know the design concepts and IS code provisions for the chimneys, bunker and silos. Design of chimneys, bunker and silos.

COURSE LEARNING OUTCOMES (CLOs):

ACE016.01	Understand the concepts of static and kinematic indeterminacy.
ACE016.02	Know the concepts of stiffness method and flexibility method.
ACE016.03	Analysis of continuous beam with and without settlement of supports using stiffness method.
ACE016.04	Analysis of single storey portal frames including side sway using stiffness method.
ACE016.05	Analysis of pin jointed determinate plane frames using stiffness method.
ACE016.06	Analysis for continuous beams up to three degree of indeterminacy using flexibility method
ACE016.07	Understand the concepts of different approximate methods of analysis for lateral loads.
ACE016.08	Analysis of multi storey frame using portal method.
ACE016.09	Analysis of multi storey frame using cantilever method.
ACE016.10	Analysis of multi storey frame using substitute frame method.
ACE016.11	Know the design concepts and IS code provisions for the retaining walls and water tanks.

ACE016.12	Understand the design of retaining walls.
ACE016.13	Understand the design of water tanks.
ACE016.14	Know the design concepts and IS code provisions for the flat slabs and deep foundations.
ACE016.15	Understand the design of flat slab.
ACE016.16	Understand the design of raft foundation.
ACE016.17	Understand the design of pile foundation.
ACE016.18	Know the design concepts and IS code provisions for the chimneys, bunker and silos.
ACE016.19	Understand the design of chimney.
ACE016.20	Understand the design of bunkers.
ACE016.21	Understand the design of silos.

MAPPING OF SEMESTER END EXAMINATION - COURSE OUTCOMES

SEE Question No		Course Learning Outcomes		Course Outcomes	Blooms Taxonomy Level
1	a	ACE016.03	Analysis of continuous beam with and without settlement of supports using stiffness method.	CO 1	Understand
	b	ACE016.03	Analysis of continuous beam with and without settlement of supports using stiffness method.	CO 1	Understand
2	a	ACE016.02	Know the concepts of stiffness method and flexibility method.	CO 1	Understand
	b	ACE016.03	Analysis of continuous beam with and without settlement of supports using stiffness method.	CO 1	Understand
3	a	ACE016.07	Understand the concepts of different approximate methods of analysis for lateral loads.	CO 2	Understand
	b	ACE016.08	Analysis of multi storey frame using portal method.	CO 2	Remember
4	a	ACE016.07	Understand the concepts of different approximate methods of analysis for lateral loads.	CO 2	Understand
	b	ACE016.09	Analysis of multi storey frame using cantilever method.	CO 2	Understand
5	a	ACE016.11	Know the design concepts and IS code provisions for the retaining walls and water tanks.	CO 3	Understand
	b	ACE016.12	Understand the design of retaining walls.	CO 3	Understand
6	a	ACE016.11	Know the design concepts and IS code provisions for the retaining walls and water tanks.	CO 3	Understand
	b	ACE016.13	Understand the design of water tanks.	CO 3	Understand
7	a	ACE016.14	Know the design concepts and IS code provisions for the flat slabs and deep foundations.	CO 4	Understand
	b	ACE016.17	Understand the design of pile foundation.	CO 4	Understand
8	a	ACE016.16	Understand the design of raft foundation.	CO 4	Understand
	b	ACE016.15	Understand the design of flat slab.	CO 4	Understand
9	a	ACE016.18	Know the design concepts and IS code provisions for the chimneys, bunker and silos.	CO 5	Understand

	b	ACE016.19	Understand the design of chimney.	CO 5	Understand
10	a	ACE016.20	Understand the design of bunkers.	CO 5	Understand
	b	ACE016.20	Understand the design of bunkers.	CO 5	Understand

Signature of Course Coordinator **HOD, CE**