Hall Ticket No. | | | | | | | | | | | Question Paper Code:BCSB28

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER- I

M.Tech I Semester End Examinations (Regular), January – 2020

Regulations: IARE-R18

THEORY OF THIN PLATES AND SHELLS

(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)	Explain about the various types of shells with neat sketches and Explain about the advantages and disadvantages of the shells.	**[7M]**
	(b)	Distinguish between thin plate with small deflection and thin plate with large deflection and derive strain curvature relation of a thin plate.	**[7M]**
2.	(a)	Derive the equation for simply supported rectangular plate under hydrostatic pressure.	**[7M]**
	(b)	What are the types of forces acting on the body explain and derive the differential equations for plate subjected to cylindrical bending.	**[7M]**

UNIT–II

3.	(a)	Using Navier solution obtain general equation for simply- supported rectangular plate under various loadings.	**[7M]**
	(b)	Derive the Navier solution for simply supported rectangular plate and obtain the maximum deflections.	**[7M]**
4.	(a)	Obtain Levy's solution for simply supported rectangular and uniformly loaded rectangular plates.	**[7 M]**
	(b)	Derive the moment curvature in the case of pure bending of plates.	**[7 M]**

UNIT – III

5.	(a)	Derive expressions for deflection, shear force and bending moment for a circular plate with si supported boundary conditions subjected to uniformly distributed loading.	**[7M]**
	(b)	A uniform loaded solid circular plate with radius 'a' has its edges simply supported obtain expressions for the maximum deflection and obtain bending moment.	**[7M]**
6.	(a)	Derive expression for Bending of the plate by shearing force Q_0 uniformly distributed along the inner edge of circular plate.	**[7M]**
	(b)	Obtain an expression for deflection in case of uniformly loaded circular plates with clamped edges.	**[7M]**

UNIT – IV

7	(a)	Define the membrane state of stress in shells. Derive equations of equilibrium, using membrane theory for cylindrical shell and obtain Mx, Mq&Mxq.	**[7M]**
	(b)	Derive the general equations for axisymmetric shells of revolution.	**[7M]**
8	(a)	Differentiate between long shells and short shells, write assumptions made in general theory of thin elastic shells.	**[7M]**
	(b)	Write a short note on a) Anti-symmetric shells. b) Singly curved shells. c) ISI classification of shells.	**[7M]**

UNIT – V

9	(a)	Derive formulae for nonlinear theory of shallow shells.	**[7M]**
	(b)	Classify thin shell into various types based on shell geometry & curvature.	**[7M]**
10	(a)	Obtain strain displacement relation, force strain relation and moment curvature relation for membrane theory of cylindrical shell.	**[7M]**
	(b)	Briefly explain about the types of shells and anti-symmetric shells.	**[7M]**

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COURSE OBJECTIVES:

The course should enable the students to:

I	Use analytical methods for the solution of thin plates and shells.
II	Use analytical methods for the solution of shells.
III	Apply the numerical techniques and tools for the complex problems in thin plates.
IV	Apply the numerical techniques and tools for the complex problems in shells.

COURSE OUTCOMES (COs):

CO 1	Understand the concept of concepts of space curves, surfaces, shell co-ordinates, boundary conditions.
CO 2	Describe the governing equation for a rectangular plate, Navier solution for simply- supported rectangular plate under various loadings, Levy solution for rectangular plate with other boundary conditions.
CO 3	Analyze under axi- symmetric loading, governing differential equation in polar co-ordinates. Approximate methods of analysis- Rayleigh-Ritz approach for simple cases in rectangular plates.
CO 4	Understand the membrane theory of cylindrical, conicaland spherical shells.
CO 5	Understand the cylindrical and conical shells, application to pipes and pressure vessels, thermal stresses in plate/shell.

COURSE LEARNING OUTCOMES (CLOs):

CBST003.01	Understand the concepts of space curves, surfaces, shell co-ordinates, boundary Conditions.
CBST003.02	Understand the concept of displacement field approximations, stress resultants.
CBST003.03	Determination of equation of equilibrium using principle of virtual work.
CBST003.04	Understand the concept of bending of thin platesand assumptions.
CBST003.05	Determination of Navier solution for simply- supported rectangular plate under various loadings.
CBST003.06	Determination of deflection of uniformly loaded simply supported rectangular plate.
CBST003.07	Solution of Navier and Levy type, large plate loaded at equidistant points by concentrated forces.
CBST003.08	Understand basic relations in polar coordinatesof circular plates.
CBST003.09	Analyze the use of superposition for the axisymmetric analysis of circular plates.
CBST003.10	Able to analyze the circular plates on elastic foundation, asymmetric bending of circular plates.
CBST003.11	Analysis of Rayleigh-Ritz approach for simple cases in rectangular plates.
CBST003.12	Analysis of membrane theory for cylindrical shells.

CBST003.13	Understand the general theory in bending of cylindrical shell, simplified method for cylindrical shell.
CBST003.14	Understand the simplified method for cylindrical shell.
CBST003.15	Understand the thermal stresses in plate/shell.
CBST003.16	Analyze shells of revolution under axisymmetric loads.
CBST003.17	Able to analyze the axisymmetric loaded conical shells.
CBST003.18	Able to analyze the axisymmetric deformation of toroidal shells.

MAPPING OF SEMESTER END EXAMINATION - COURSE LEARNING OUTCOMES

SEE Question No.		Course Learning Outcomes		Course Outcomes	Bloom's Taxonomy Level
1	a	BCSB28.01	Understand the concepts of space curves, surfaces, shell co-ordinates, boundary Conditions.	CO 1	Remember
	b	BCSB28.06	Understand the concept of displacement field approximations, stress resultants.	CO 1	Understand
2	a	BCSB28.05	Determination of equation of equilibrium using principle of virtual work.	CO 1	Understand
	b	BCSB28.06	Understand the concept of bending of thin platesand assumptions.	CO 1	Understand
3	a	BCSB28.07	Determination of Navier solution for simply- supported rectangular plate under various loadings.	CO 2	Remember
	b	BCSB28.09	Determination of deflection of uniformly loaded simply supported rectangular plate.	CO 2	Understand
4	a	BCSB28.07	Solution of Navier and Levy type, large plate loaded a equidistant points by concentrated forces.	CO 2	Understand
	b	BCSB28.010	Understand basic relations in polar coordinatesof circular plates.	CO 2	Understand
5	a	BCSB28.12	Analyze the use of superposition for the axisymmetric analysis of circular plates.	CO 3	Understand
	b	BCSB28.12	Able to analyze the circular plates on elastic foundation, asymmetric bending of circular plates.	CO 3	Remember
6	a	BCSB28.13	Analysis of Rayleigh-Ritz approach for simple cases in rectangular plates.	CO 3	Remember
	b	BCSB28.13	Analysis of membrane theory for cylindrical shells.	CO 3	Understand
7	a	BCSB28.14	Understand the general theory in bending of cylindrical shell, simplified method for cylindrical shell.	CO 4	Remember
	b	BCSB28.17	Understand the simplified method for cylindrical shell.	CO 4	Understand
8	a	BCSB28.17	Understand the thermal stresses in plate/shell.	CO 4	Understand
	b	BCSB28.15	Analyze shells of revolution under axisymmetric loads.	CO 4	Understand
9	a	BCSB28.18	Able to analyze the axisymmetric loaded conical shells.	CO 5	Remember

	b	BCSB28.17	Able to analyze the axisymmetric deformation of toroidal shells.	CO 5	Understand
10	a	BCSB28.17	Understand the concepts of space curves, surfaces, shell co-ordinates, boundary Conditions.	CO 5	Remember
	b	BCSB28.18	Understand the concept of displacement field approximations, stress resultants.	CO 5	Understand

Signature of Course Coordinator **HOD, CE**