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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

MODEL QUESTION PAPER- II

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

Regulations: IARE-R18

THEORY OF 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)	Derive the differential equations of cylindrical bending of uniformly loaded rectangular platewith simply supported edge.	**[7M]**
	(b)	Explain and state formulae for maximum and minimum bending stress for plates under sinusoidal load.	**[7M]**
2.	(a)	What are the Compatibility equations and equilibrium equations for rectangular thin plate.	**[7M]**
	(b)	Determine the deflection and internal moments of simply supported rectangular support plate of size a x b.	**[7M]**

UNIT – II

3.	(a)	Derive cylindrical bending of uniformly loaded rectangular plates with fixed edges.	**[7M]**
	(b)	Find Levy's solution for simply supported and uniformly loaded rectangular plates.	**[7M]**
4.	(a)	Derive the relations between bending moments and curvature in pure bending of plates.	**[7 M]**
	(b)	Derive the differential equations of small deflections of laterally loaded plates (Lagrange's equations).	**[7 M]**

UNIT – III

5.	(a)	Expression for slope and deflection for circular plate with a circular hole at the Centre.	**[7M]**
	(b)	Deflection produced by the moment in case of circular plate concentrically loaded..	**[7M]**
6.	(a)	Obtain differential equation for symmetrical bending of laterally loaded circular plate.	**[7M]**
	(b)	Obtain the expression for deflection in case of uniformly loaded circular plates with clamped edges.	**[7M]**

UNIT – IV

7	(a)	DeriveShorer's differential equation, explain the bending and membrane theories for analysis of shells.	**[7M]**
	(b)	Derive the membrane stress resultants for rectangular hyperbolic paraboloid on straight line generators.	**[7M]**
8	(a)	Derivation for shells in the form of a surface of revolution and loaded symmetrically with their axis.	**[7M]**
	(b)	Determine the deflection and internal moments of simply supported rectangular support plate of size a x b.	**[7M]**

UNIT – V

9	(a)	Explain about the bending theory of shells with figures and membrane theory of anticlastic shells.	**[7M]**
	(b)	Explain about the following , i) Membrane behavior.ii) Membrane equation.iii) Singly curved shells	**[7M]**
10	(a)	Differentiate between long shells and short shells ,derive geometrical relations for shells of double curvature.	**[7M]**
	(b)	Write a short note on i) Anti-symmetric shells ii) Singly curved shells iii) ISI classification of shells iv) Explain about the advantages and disadvantages of the 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 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 at equidistan 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**