School of Aeronautics (Neemrana)

I-04, RIICO Industrial Area, Neemrana, Dist. Alwar, Rajasthan

Approved by Director General of Civil Aviation, Govt. of India, All India Council for Technical Education
Ministry of HRD, Govt of India & Affiliated to Rajasthan Technical University, Kota & BTU, Bikaner Rajasthan

Question Paper For Internal Assessment Examination (Theory) - Credit 4 / 5 /

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• **Instructions For Students / FacultyMid Term I (Total 80 Marks, 2 HRS. Syllabus From Beginning Of Session)**

◦ Part A: Total number of questions to be given are ten, each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 20 marks.

◦ Part B: Total number of questions to be given are six, out of which student has to answer any four. They are long answer type (**Not More Than 50 Words For Question)**, each carrying 6 marks. Total 24 marks.

◦ Part C: Total number of questions to be given are four, out of which student has to answer any three. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 12 marks. Total 36 marks.**Mid Term II & III (Total 120 Marks, 2.5 HRS. Syllabus From Beginning Of Session)**

◦ Part A: Total number of questions to be given are ten, each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 20 marks.

◦ Part B: Total number of questions to be given are seven, out of which student has to answer any five. They are long answer type (**Not More Than 50 Words For Question)**, each carrying 8 marks. Total 40 marks.

◦ Part C: Total number of questions to be given are five, out of which student has to answer any four. They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)***, each carrying 15 marks. Total 60 marks.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: NO SUBJECT UNDER CREDIT FOUR

FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICALELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER

STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF EXAM, AND MAY LEAVE THE EXAM HALL ON EXPIRY OF ATLEAST OF 1 Hr FROM THE STARTING TIME OF EXAMINATION.

Question Paper & Student Details

Mid Term	Mid Term 2	**Date of Submission**	21/08/2020
Name of Faculty	Mr. Rahul Dev Bairwan	**Date of Examination**	26/08/2020
Course	B.Tech (Mechatronics Engineering)	**Semester**	SEMESTER : 3
Batch	Fifth (5)	**Subject**	3 MH4 - 05 Mechanics of Solids (Cr 4)

COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPER
(Faculties are required to mention relevant Course Outcome number against the respective question in QP)

Course Outcome	3MH4 - 05 Mechanics of Solids (credit-4) COURSE OBJECTIVE 1. To understand the concept of stress and strain in different types of structures under different loading conditions. 2. To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. 3. To learn about the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading. 4. To build the necessary theoretical background for further structural analysis. 5. To understand the concept of torsion and buckling in columns. COURSE OUTCOME 1. They will understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for different lading conditions. 2. Calculate and represent the stress diagrams in bars and simple structures. 3. Solve problems relating to pure and non-uniform bending of beams and other simple structures. 4. Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures. 5. Understand the concept of buckling and be able to solve the problems related to isolated bars.

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Student Name		**Student Reg No.**	

Part A	
Question : 1	Define direct and indirect stresses.

1	Concept of Stress	Mechanics of Solids by S. S. Bhavikatti	1
Question : 2	Define pure bending.		
9	Members Subjected to Flexural Loads	Mechanics of Solid by SS Bhavikatti,	3
Question : 3	Differentiate between Plastic and visco-elastic material.		
5	Concept of Stress	Mechanics of solids by SS bhavikatti	1
Question : 4	Define factor of safety and permissible stress.		
8	Concept of factor of safety	Mechanics of solids by SS bhavikatti	1
Question : 5	Define point of contraflexure.		
12	Shear force and Bending moment	Mechanics of solids by SS bhavikatti	3
Question : 6	What is the concept behind finding transverse shear stress?		
14	Shear stress in Beams	Mechanics of solids by SS bhavikatti	3
Question : 7	Define major and minor principal stress.		
18	Principal Planes, Stresses and Strains	Mechanics of solids by SS bhavikatti	2
Question : 8	Define distortion energy.		
26	Significance and comparison & applications.	Strength of materials by UC Jindal,	2
Question : 9	What are the limitations of Maximum shear stress theory?		
24	Different theories of failure	Strength of materials by UC Jindal,	2
Question : 10	Write the advantage of graphical method over analytical method.		
21	Mohr’s circle of stress and strain	Strength of materials by S Ramamrutham,	1
Part B			
Question : 1	Derive relation between Modulus of elasticity and Bulk modulus.		
4	Elastic constants and their relations	Mechanics of Solids by SS Bhavikatti	1
Question : 2	A cantilever beam is loaded as shown. Determine all reactions at support A.		
12	Shear force and Bending moment	Mechanics of Solids by SS Bhavikatti	3
Question : 3	Derive the equations for normal and tangential stresses on oblique plane for a 2-D state of stress.		
16	Principal Planes, Stresses and Strains	Mechanics of Solids by SS Bhavikatti	2
Question : 4	Derive bending equation.		
9	Members subjected to flexural loads	Mechanics of Solids by SS Bhavikatti	3
Question : 5	Explain maximum principal stress theory.		
24	Different theories of failure	Strength of materials by UC Jindal	2
Question : 6	For a given loading conditions the state of stress in the wall of a cylinder is expressed as follows: (a) 85 MN/m^2 tensile at x axis (b) 25 MN/m^2 tensile at y axis (c) Shear stresses of 60 MN/m^2 on horizontal planes is clockwise in effect. Calculate the principal stresses and the planes on which they act.		
21	Principal Planes, Stresses and Strains	Mechanics of Solids by SS Bhavikatti	2
Question : 7	A cast iron column has the external diameter of 300mm and 20mm thick. Find the safe compressive load on the column with factor of safety of 5, if the crushing strength of the material is 550N/mm^2.		

7	Concept of factor of safety	Mechanics of Solids by SS Bhavikatti	1
Part C			
Question : 1	A solid circular shaft of diameter dis subjected to a pure torque of 20 Nm. Determine the diameter of the shaft according to the maximum principal stress theory, taking the factor of safety as 2; if the yield strength of the material is 310 N/mm^2.		
24	Different theories of failure	Strength of materials by UC Jindal	2
Question : 2	Calculate the shear force and bending moment for the beam subjected to the loads as shown in the figure, then draw the shear force diagram (SFD) and bending moment diagram (BMD).		
12	Shear force and Bending moment	Mechanics of Solids by SS Bhavikatti	3
Question : 3	The simply supported beam in Fig. has a rectangular cross section 120 mm wide and 200 mm high. (1) Compute the maximum bending stress in the beam. (2) Sketch the bending stress distribution over the cross section on which the maximum bending stress occurs. (3) Compute the bending stress at a point on section B that is 25 mm below the top of the beam.		
13	Bending stresses & Section modulus	Mechanics of Solids by SS Bhavikatti	3
Question : 4	An I - section girder, 200mm wide by 300 mm depth flange and web of thickness is 20 mm is used as simply supported beam for a span of 7 m. The girder carries a distributed load of 5 KN /m and a concentrated load of 20 KN at mid-span. Determine the (i). The second moment of area of the cross-section of the girder (ii). The maximum stress set up.		
12	Bending stresses & Section modulus	Mechanics of Solids by SS Bhavikatti	3
Question : 5	A beam of wide-flange shape with b = 165 mm, t = 7.5mm, h = 320 mm, and h1 = 290 mm, vertical shear force V = 45 kN determine τmax, τmin and total shear force in the web.		
14	Transverse shear stress	Mechanics of Solids by SS Bhavikatti	2
Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions. *(Mention question number with relevant fig / numerical / equations. Max 150 KB)*			
I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.			

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