

CBCS SCHEME - Make-Up Exam

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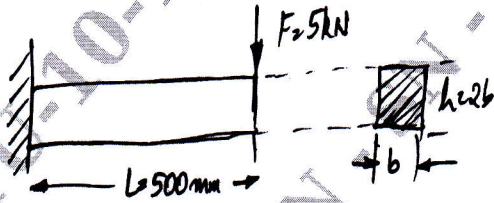
BAE502

Fifth Semester B.E./B.Tech. Degree Examination, June/July 2025 Aircraft Structures

Time: 3 hrs.

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module – 1				M	L	C
Q.1	a.	Explain the following with neat sketches i) Normal stress ii) Shear stress iii) Biaxial stress iv) Triaxial stress v) Principle stress	10	L2	CO1	
	b.	Determine the dimension of a cantilever beam of rectangular cross-section, of which depth is twice the width, subjected to a transversal load of 5kN with 500 mm span length. Assume FOS = 2.5  Also assume $\sigma_y = 324 \text{ MPa}$ The section modulus is $bh^2/6$. Fig Q1(b)	10	L3	CO1	
OR						
Q.2	a.	Explain the following i) Maximum shear stress- theory ii) Maximum strain theory iii) Strain energy theory iv) Distortion energy theory v) Maximum normal stress theory	10	L2	CO1	
	b.	Stress induced at a critical point in a machine component made of steel 45CB with $\sigma_{yt} = 380 \text{ N/mm}^2$ are as follows : $\sigma_x = 100 \text{ N/mm}^2$; $\sigma_y = 50 \text{ N/mm}^2$; $\tau_{xy} = 75 \text{ N/mm}^2$ Calculate FOS by i) Maximum normal stress theory ii) Distortion energy theory.	10	L3	CO1	
Module – 2						
Q.3	a.	Explain the Goodman and Soderburg relationship.	10	L2	CO1	
	b.	Explain cumulative fatigue damage.	10	L2	CO1	

OR					
Q.4	a.	Derive an expression for instantaneous stress due to axial impact on vertical bar.	10	L3	CO1
	b.	Explain the influence of modifying factors.	10	L2	CO1
Module – 3					
Q.5	a.	Derive Euler's crippling load for a column when both the ends are hinged.	10	L3	CO1
	b.	Find the Euler's crippling load for a hollow cylindrical steel column of 40 mm out diameter and 4 mm thick. Length of the column is 2.5m and is hinged at both ends. Let $E = 205 \text{ GPa}$. Also compute Rankine's crippling load with constants 335 MPa and $1/7500$.	10	L3	CO1
OR					
Q.6	a.	With a neat sketch, explain V-n diagram.	10	L2	CO2
	b.	Explain the different types of loads on aircraft.	10	L2	CO2
Module – 4					
Q.7	a.	Derive Clapeyron's three moment equation.	10	L3	CO2
	b.	Explain statically determinate and indeterminate structures.	10	L2	CO2
OR					
Q.8	a.	Analyze the plane truss for its stresses with suitable diagram.	10	L3	CO2
	b.	Define stress and explain the application of beams, truss and frames in aircraft structures.	10	L2	CO2
Module – 5					
Q.9	a.	Derive stress distribution due to unsymmetric bending.	10	L3	CO3
	b.	Derive the relationship between load intensity, shear force and bending movement.	10	L3	CO3
OR					
Q.10	a.	Derive the stress distribution due to symmetric bending due to skew loads, citing load condition.	10	L3	CO3
	b.	Highlight the differences in stress distribution between symmetric and unsymmetric bending due to bending load with figures.	10	L2	CO3
