CBCS SCHEME - Make-Up Exam

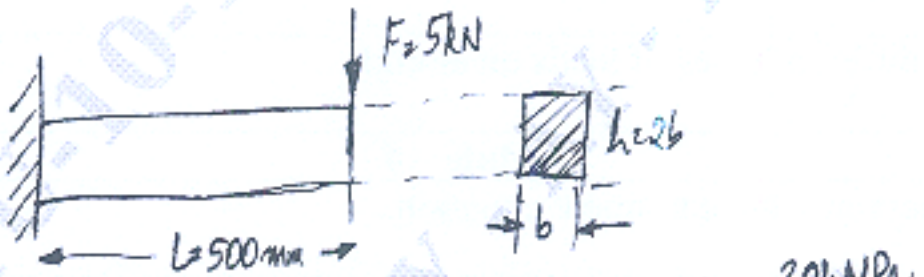
USN | | | | | | | | | |

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  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 $\sigma_{yt} = 380$ N/mm^2 are as follows : $\sigma_x = 100$ N/mm^2 ; $\sigma_y = 50$ N/mm^2 ; $\tau_{xy} = 75$ 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 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 duct 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**

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