INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal- 500 043, Hyderabad.

AERONAUTICAL ENGINEERING

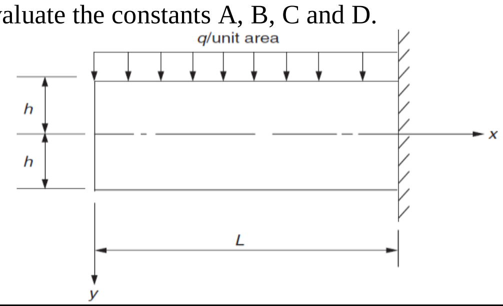
TUTORIAL ASSIGNMENT

Course Name	:	**AEROSPACE VEHICLE STRUCTURES-1**
Course Code	:	A42103
Class	:	II B.Tech II semester
Branch	:	Aeronautical Engineering
Year	:	2016 – 2017
Course Coordinator	:	Mr. G S D Madhav, Assistant Professor
Course Faculty	:	Mr. G S D Madhav, Ms. Y. Shwetha and Mr. G Ram Vishal

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process

S. No	Question	Blooms Taxonomy Level	Course Outcome
	ASSIGNMENT-I **UNIT I**		
1	A structural member supports loads which produce, at a particular point, a direct tensile stress of 80N/mm² and a shear stress of 45N/mm² on the same plane. Calculate the values and directions Of the principal stresses at the point and also the maximum stress, stating on which planes this will act.	Apply	1
2	A solid shaft of circular cross-section supports a torque of 50KNm and a bending moment of 25KNm. If the diameter of the shaft is 150mm calculate the values of the principal stresses and their directions at a point on the surface of the shaft?	Apply	1
3	A shear stress τ_{xy} acts in a two-dimensional field in which the maximum allowable shear stress is denoted by τ_{max} and the major principal stress by σ_1. Derive using the geometry of Mohr's circle of stress, expressions for the maximum values of direct stress which may be applied to the x and y planes in terms of three parameters given above.	Apply	1
4	A cantilever of length L and depth 2h is in a state of plane stress. The cantilever is of unit thickness, is rigidly supported at the end x=L and is located as shown in figure. Show that stress function $\phi = Ax^2+Bx^2y+Cy^3+D(5x^2y^3-y^5)$ is valid for the beam and evaluate the constants A, B, C and D. 	Analyze	1

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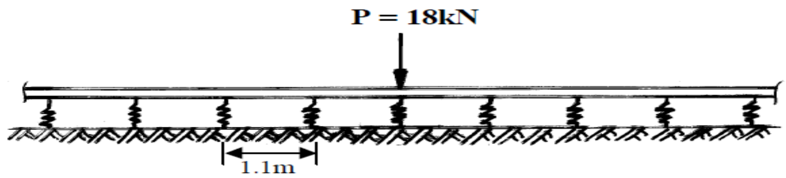
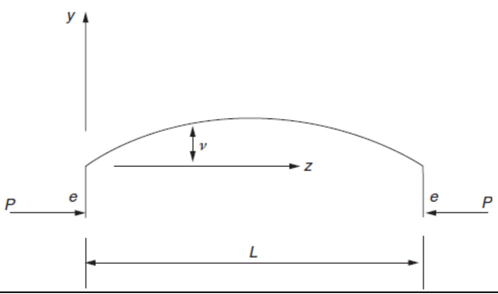
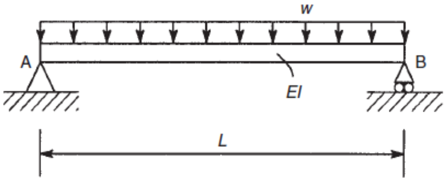
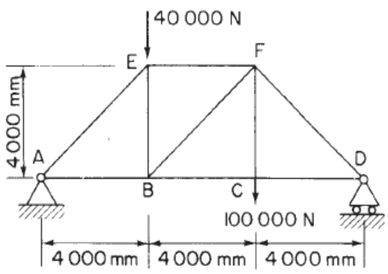
5	**Write** equations of equilibrium for elastic body under three dimensional force systems. Also draw neat sketch representing forces.	Understand	1
	UNIT II		
1	**Develop** relation between shear force, bending moment and rate of loading.	Understand	3
2	**Find** the expressions for maximum deflection and bending moment of beam under concentrated load.	Analyze	3
3	**Discuss** about area moment method with example.	Knowledge	2
4	**Find** the deflection of the cantilever beam at the point of application of 1000 N load. Assume elastic deflections with EI = 106 N-m^2	Analyze	2
5	**Discuss** about claypron`s method with example.	Knowledge	2
	ASSIGNMENT-II **UNIT III**		
1	An infinite beam rest on equally spaced linear coil springs, located every 1.1m along the beam. A concentrated load of 18kN is applied to the beam, over one of the springs. EI of the beam is 441x109 Nmm^2, K = 275 N/mm for each spring. Compute the largest spring force and largest bending moment in the beam. 	Apply	4
2	A semi-infinite steel bar (E = 200GPa) has a square cross section (b = h = 80mm) and rests on a Winkler foundation of modulus ko = 0.25 N/mm2/mm. A downward force of 50kN is applied to the end. Find the maximum and minimum deflections and their locations. Also find max. Flexural stress and its location.	Apply	4
3	**Derive** governing equations for Uniform Straight beam on elastic foundation	Apply	4
4	**Derive** the differential equation for the elastic line of a beam resting on elastic foundation.	Understand	4
5	**Discuss** the concept of elastic foundation	Understand	4
	UNIT IV		
1	The pin-jointed column shown in Figure carries a compressive load *P* applied eccentrically at a distance *e* from the axis of the column. Determine the maximum bending moment in the column 	Evaluate	5
2	A solid round bar 3m long and 5cm in diameter is used as a strut. Determine the crippling load if a. Both ends of strut are hinged b. One end of strut is fixed and other end is free c. Both ends of strut are fixed d. One end is fixed and other is hinged	Apply	5
3	Calculate the Euler's critical load for a strut of T-section, the flange width being 10cm, overall depth 8cm and both flange and stem 1cm thick. The strut is 3m long and is built in at both ends. Take E= 2×10^5 N/mm^2.	Apply	6
4	A column of timber section 15cm×20cm is 6m long. If E=17.5KN/mm^2. Determine crippling load and safe load for the column if both ends are fixed and factor of safety is 3.	Apply	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
5	A strut length l, moment of inertia of cross section I uniform throughout and modulus of material E, is fixed at its lower end, and its upper end is elastically supported laterally by a spring of stiffness k. show from the first principles that the crippling load P is given by (tan α l)/(αl) = [1- (P/kL)], where α^2= (P/EI)	Develop	5
	UNIT V		
1	**State** and Prove Castigliano's first theorem.	Understand	7
2	**Discuss** principle of virtual work for a particle	Understand	8
3	**Differentiate** between a single cell and a multiple cell structure.	Understand	9
4	Use the principle of virtual work to calculate the vertical displacements at the quarter- and mid-span points in the beam shown in figure. 	Evaluate	7
5	Calculate the vertical deflection of the point B and the horizontal movement of D in the pin-jointed framework shown in Figure All members of the framework are linearly elastic and have cross-sectional areas of 1800mm^2. *E* for the material of the members is 200 000 N/mm^2 	Evaluate	8

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