

## Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

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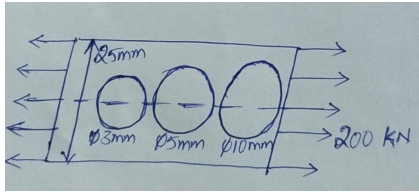
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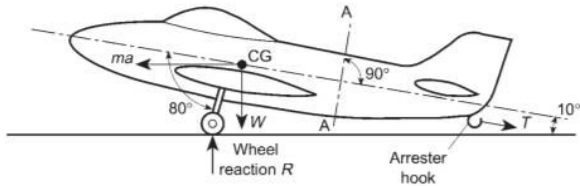
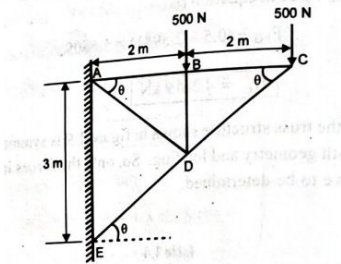
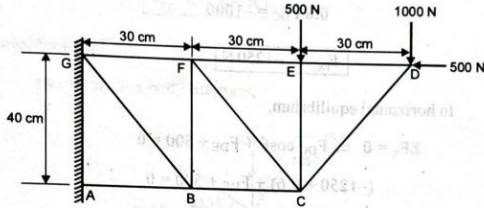
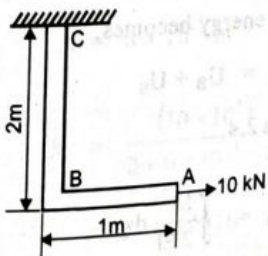
### Fourth Semester B.E. Degree Examination Aerospace Structures-I

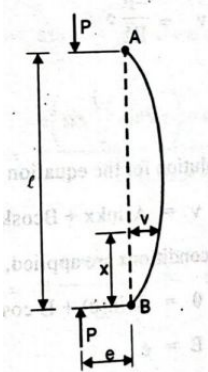
TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.  
02.  
03.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Define and derive principal stresses with neat sketches.	L2	
	b	Calculate the normal, shear stresses, principal stresses, maximum shear stresses magnitude and direction for the rectangular section under the tensile stress of 100 N/mm <sup>2</sup> along X axis, compressive stress of 50 N/mm <sup>2</sup> along Y-axis, shear of 20 N/mm <sup>2</sup> and making vertical inclination of 30°.	L3	10
OR				
Q.02	a	A shaft subjected to a torque of 12 kNm and bending moment of 9 kNm. The shaft is circular, then find the diameter of the shaft according to any two theories of failures if elastic limit tension is 320 MPa and poisson's ratio of 0.29.	L3	10
	b	Calculate the maximum stress for the following rectangular section by considering stress concentration into account. 	L3	10
Module-2				
Q. 03	a	Write a note on fatigue failure.	L1	10
	b	A steel rod having 1.5 m long and it resists an an impact load of 25 kN falling under gravity at a velocity of 0.99 m/s. Maximum stress is limited up to 150 MPa. Determine the diameter of the rod and impact factor where E= 206.8 kN/mm <sup>2</sup> .	L3	10
OR				
Q.04	a	An automobile engine shaft rotates and in each rotation stress varies from maximum of 20000 N/mm <sup>2</sup> to minimum of 1000 N/mm <sup>2</sup> . The material has ultimate stress of 80000 N/mm <sup>2</sup> , yield stress of 60000 N/mm <sup>2</sup> , endurance limit stress is 28000 N/mm <sup>2</sup> . Assume $k=k_f=$ , find the factor of safety by using Goodman and soderberg's criteria.	L3	10
	b	A machine component is subjected to bending stress which fluctuates between 300 N/mm <sup>2</sup> of tensile and 150 N/mm <sup>2</sup> of compressive in cyclic manner. Using the Goodman and soderberg's criteria, calculate the minimum required ultimate tensile strength of the material. Take factor of safety is 1.5 and endurance limit in reverse bending as 50% of ultimate tensile strength.	L3	10
Module-3				
Q. 05	a	Write about the structural nomenclature of the aircraft.	L1	10

	b	Illustrate the desirable properties of aircraft propulsion.	L1	10
OR				
Q. 06	a	Explain velocity diagrams with neat sketches.	L1	10
	b	An aircraft having a total weight of 45 kN lands on the deck of an aircraft carrier and is brought to rest by means of a cable engaged by an arrester hook, as shown in the following Fig. If the deceleration induced by the cable is $3g$ determine the tension, $T$ , in the cable, the load on an undercarriage strut and the shear and axial loads in the fuselage at the section AA; the weight of the aircraft aft of AA is 4.5 kN. Calculate also the length of deck covered by the aircraft before it is brought to rest if the touch-down speed is 25 m/s.	L3	10
				
<b>Module-4</b>				
Q. 07	a	Explain strain displacement relations.	L1	10
	b	Calculate the forces in the members of the following truss.	L3	10
				
OR				
Q. 08	a	Determine the end moments of a fixed-fixed beam of span AB having length 'l' subjected to point load of P at length of l/4 from the supports (both ends) and at the midpoint. Draw the bending moment diagram by using Clapeyron's moment method.	L2	10
	b	Calculate the forces in the members of the following truss.	L3	10
				
<b>Module-5</b>				
Q. 09	a	Calculate the total strain energy for the given L section of 60 mm*120 m ( flange) in cross section. Take $E = 2 * 10^5$ MPa and $G = 0.8 * 10^5$ MPa.	L3	10
				
	b	A simply supported beam of length 'l' subjected to a point load 'W' at a distance 'a' from one end. Assume the beam having constant cross section with flexural rigidity EI. Find the strain energy of the beam and deflection under the load.	L2	10

		OR		
Q. 10	a	A bar of length $l$ when used as a simply supported beam subjected to a UDL of 30 kN/m over the whole span, deflects 15 mm at centre. Determine the crippling loads when it is used as a column with following end conditions: i) both ends fixed ii) both ends hinged iii) hinged- free iv) fixed-free	L3	10
	b	Derive maximum bending moment for the following column. 	L2	10

\*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.