Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17AE2018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **AIRCRAFT STRUCTURES – II** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain the need of structural idealization. | CO4 | 8 |
| b. | List the criteria used to lump the bending carrying ability of webs at suitable points in thin walled structures. | CO4 | 8 |
| c. | Differentiate between symmetrical and unsymmetrical bending. | CO4 | 4 |
| **(OR)** | | | | |
| 2. | a. | Explain the advantage of using semi-monocoque structure over monocoque structures. | CO2 | 4 |
| b. | A wood cantilever beam of rectangular cross section supports an inclined load P at its free end as shown in Figure. Calculate the maximum tensile stress (σmax) and the maximum deflection (δ) of the due to the load P. Data for the beam are as follows: breath (b) = 75 mm, depth (d) = 150 mm, Length (L) = 1.5 m, load (P) = 800 N, angle (θ) = 300 and Young’s modulus E = 12 GPa. | CO4 | 16 |
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| 3. | a. | Product of moment of inertia of a section having one axis of symmetry is \_\_\_\_\_\_. | CO1 | 2 |
| b. | Find the shear flow distribution and shear center for a thin walled ‘C’ section beam of thickness 3 mm, flange width 7.5 cm and web height 15 cm. The beam is subjected to a vertical load of 7 kN through the shear center. | CO1 | 18 |
| **(OR)** | | | | |
| 4. | a. | Explain briefly about the shear flow and write its unit. | CO1 | 4 |
| b. | Determine the shear flow and locate the shear center for the ‘C’ section shear web beam as shown in the figure. Assume area of each boom = 4 cm2. | CO1 | 16 |
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| 5. | a. | Find Ixx for a thin walled section with thickness = t and flange width = web height = h. | CO2 | 4 |
| b. | The figure shows a single cell beam with four flanges (booms). Find the internal shear flow when the beam carries an external load of 2000 N. | CO2 | 16 |
| **(OR)** | | | | |
| 6. | a. | Explain the effect of a boom on a closed thin wall structure subjected to a torque. | CO2 | 2 |
| b. | Obtain the shear stress distribution in the walls of the 2-cell structure shown in Figure with uniform thickness of 0.25 cm. Applied clockwise twisting moment = 1500 Nm. Use shear modulus (G) = 50 GPa. | CO2 | 18 |
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| 7. | a. | Give the expression for the flexural rigidity of the plate. | CO3 | 2 |
| b. | Lips and bulbs in thin-walled structure are used to increase the buckling load. Justify the statement. | CO3 | 6 |
| c. | Write short notes on complete tension field beam and semi tension field beam. | CO6 | 12 |
| **(OR)** | | | | |
| 8. | a. | Explain the Needham method of estimating crippling stresses. | CO3 | 8 |
| b. | Find the margin of safety in buckling for the box beam shown in Figure. Given P1 = P2 = 10 kN. Area of each stringer = 2 cm2 and the sheet thickness = 1.5 mm. Assume the sheets are effective in bending and made of 2024-T3 aluminium alloy. For a/b = 2, Kc = 5 & Ks = 6.5 and for a/b = 3, Kc = 4 & Ks = 5.8. | CO3 | 12 |
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|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the reason for a constant shear flow between two booms in ashear web beam. | CO2 | 2 |
| b. | Find the shear center for the wing cross section shown in Figure. Web 3 has a thickness of 0.064 cm and the other webs have thickness of 0.04 cm. Assume shear modulus G is constant for all cross section. The cross section is symmetrical about a horizontal axis. | CO4 | 18 |