CBCS SCHEME

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15AE64

Sixth Semester B.E. Degree Examination, Feb./Mar. 2022
Aircraft Structures – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the equation for direct stress distribution due to unsymmetrical bending and position of neutral axis. **(10 Marks)**

b. Formulate the relationship between load intensity shear force and bending moment. **(06 Marks)**

OR

2 a. A beam having the cross section as shown in Fig.Q.2(a) is subjected to bending moment of 1500Nm in a vertical plane, calculate the maximum direct stress stating at which point it acts. **(10 Marks)**

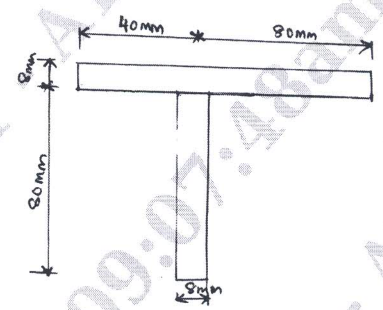

Fig.Q.2(a)

b. Derive an expression for shear flow in an open section thin walled beam. **(06 Marks)**

Module-2

3 a. Explain the structural idealization principle and explain the idealization procedure of a panel. **(08 Marks)**

b. Calculate the shear flow distribution in the channel section shown in Fig.Q.3(b). Produced by a vertical shear load of 4.8kN acting through its shear centre. Assume that the walls of the section are only effective in resisting shear stresses while the booms, each of area $300mm^2$ carry all direct stresses. **(08 Marks)**

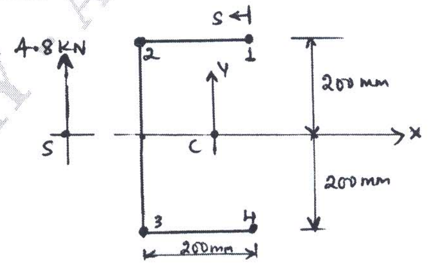

Fig.Q.3(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

4 a. Find the angle of twist per unit length in the using whose cross section is sown in Fig.Q.4(a). When it is subjected to a torque of 10kNm. Find also the maximum shear stress in the section. G = 25000N/mm^2. Wall 12 (outer) = 900mm. Nose cell area = 20000mm^2.

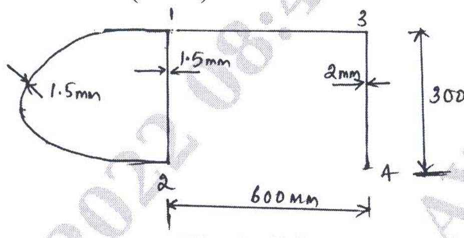

Fig.Q.4(a) **(10 Marks)**

b. Briefly explain the effect of idealization on the analysis of open and closed section beams. **(06 Marks)**

Module-3

5 a. Derive an expression for buckling stress for a rectangular thin plate in compression. **(12 Marks)**

b. Write a short note on crippling stress and buckling stress. **(04 Marks)**

OR

6 a. Briefly explain the failure of bolted and riveted joints. **(08 Marks)**

b. Find the resultant force in each rivet of the connection shown in Fig.Q.6(b). **(08 Marks)**

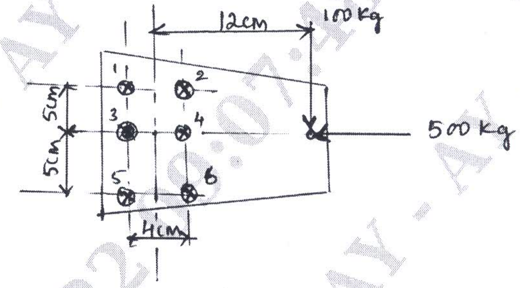

Fig.Q.6(b)

Module-4

7 The thin walled single cell beam shown in Fig.Q.7 has been idealized into a combination of direct stress carrying booms and shear stress only carrying walls, if the section supports a vertical shear load of 10kN acting in a vertical plane through boom 3 and 6. Calculate the distribution of shear flow around the section. Boom Areas: $B_1 = B_8 = 200$mm^2, $B_2 = B_7 = 250$mm^2, $B_3 = B_6 = 400$mm^2, $B_4 = B_5 = 100$mm^2. The centroid of the direct stress carrying are lies on the horizontal axis of symmetry. **(16 Marks)**

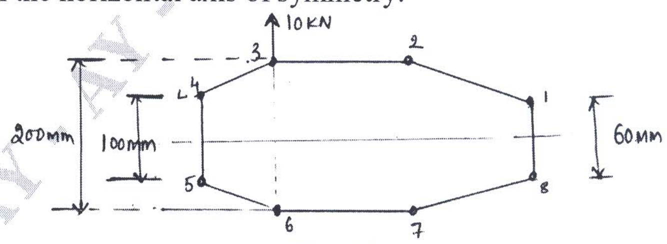

Fig.Q.7

OR

8 Determine the shear flow distribution in the web of the tapered beam shown in Fig.Q.8 at section midway along its length. The web of the beam has a thickness of 2mm and is fully effective in resisting direct stress. The beam tapers symmetrically about its horizontal centroidal axis and the cross sectional area of each flange is $400mm^2$. **(16 Marks)**

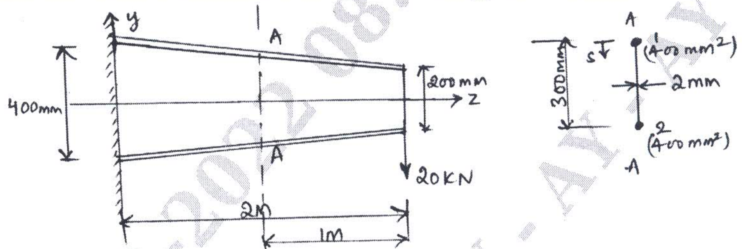

Fig.Q.8

Module-5

9 a. Explain the principles of stiffness construction with an example. **(08 Marks)**

b. Briefly explain cut outs in fuselages and obtain the expressions for shear flow. **(08 Marks)**

OR

10 The fuselage of a light passenger carrying aircraft has the circular cross-section as shown in Fig.Q.10. The cross sectional area of each stringer is $100mm^2$ and the vertical distances given in Fig.Q.10 are to the mid line of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200kNm applied in vertical plane of symmetry at this section calculate the direct stress distribution. **(16 Marks)**

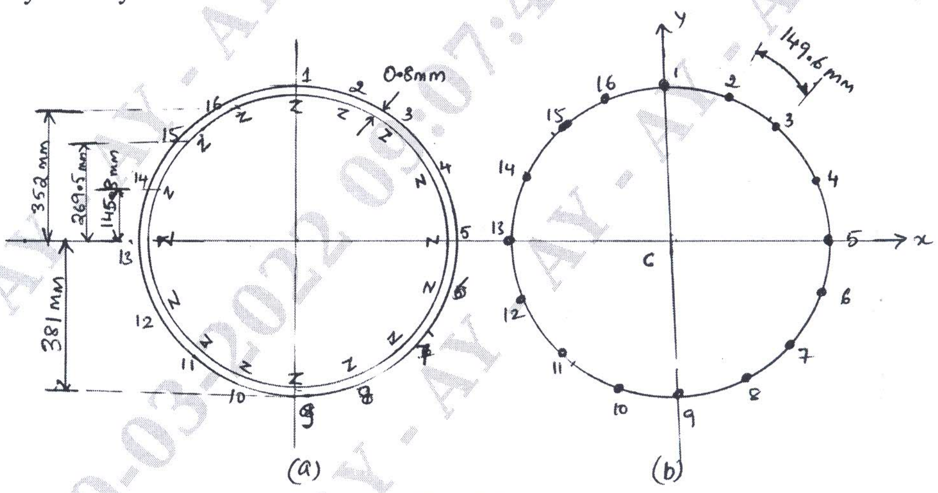

Fig.Q.10

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