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CBCS SCHEME

USN

15AE64

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Aircraft Structures – II

Time: 3 hrs. Max. Marks: 80

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

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.

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Module-1

1 a. Define unsymmetrical Bending and explain its sign conventions. **(06 Marks)**

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

OR

2 a. The beam section shown in Fig Q2(a) is subjected to a bending moment of 10kN.m in both the axes. Determine the distribution of direct stress.

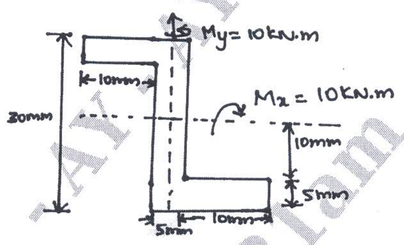

Fig Q2(a) **(12 Marks)**

b. Derive the Bredth – Batho Theory (Rule) **(04 Marks)**

Module-2

3 a. Explain Bredt-Batho theory and derive Bredt-batho formula. **(08 Marks)**

b. If Torque at the section is 3×10^3Nm. Obtain the shear flow q, maxi shear stress element and its value, rotation θ of the section. Given G = 26.3×10^3Pa. $t_1 = 0.005$ m ; $t_2 = t_3 = 0.007$ m.

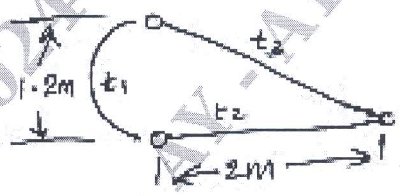

Fig.Q3(b) **(08 Marks)**

OR

4 a. Derive Soderberg relation when a specimen is subjected to axial cyclic stress. **(08 Marks)**

b. 2 cell thin walled box beam is subjected to a torque T that causes a twist angle θ = 5°/m. Assume G = 27 GPa, find shear flow q_1, q_2 and J.
$t_1 = 0.2$ cm ; $t_2 = 0.4$ cm ; $t_{12} = 0.3$ cm

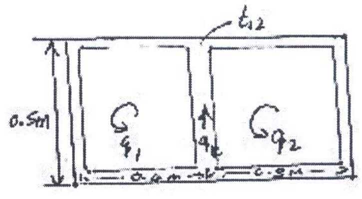

Fig.Q4(b) **(08 Marks)**

Module-3

5 a. Determine the Crippling stress using Needham and Gerard method. **(08 Marks)**

b. Explain Bolted joint (or) riveted joints and welded joints and explain the concept of effective width. **(08 Marks)**

OR

6 a. Explain eccentrically loaded convections. **(08 Marks)**

b. Determine the Buckling of Isotropic flat plates in compression. **(08 Marks)**

Module-4

7 a. What are complete tension field beams (Wagner's beam)? Explain and derive an expression for tension stress and normal stress in web of Wagner beams. **(08 Marks)**

b. Determine the flange axial load, shear load distribution in the web of tapered beam at section AA for a single spar wing construction. Where web thickness is 2.5 mm, flange area is 375 mm2. Depth of flange at AA = 300 mm.

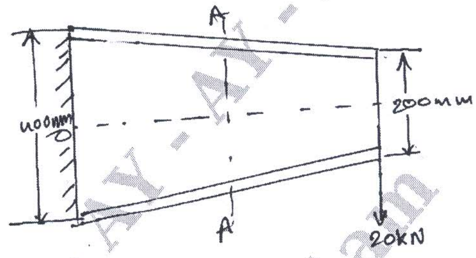

Fig.Q7(b) **(08 Marks)**

OR

8 a. The beam shown is assumed to have a complete tension field web. If the cross sectional area of flanges and stiffness are 350 mm^2 and 300 mm^2 and elastic section modulus of each flange is 750 mm3, determine maximum stress in flange and also find whether the stiffners will buckle. Thickness of web 2 mm. Second M.I. of stiffners about an axis in the plane of web is 2000 mm^4. E = 70,000 N/mm^2.

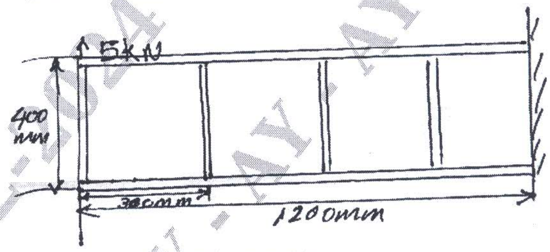

Fig.Q8(b) **(08 Marks)**

b. A wing spar has dimensions shown and carries a uniformly distributed load of 15 kN/m along its complete length. Each flange has a cross section area of 500 mm2 with top flange being horizontal. If the flanges are assumed to resist all direct loads with the spur web effective in shear only, determine the flange loads and shear flows in the web at section 1 and 2 from the free end.

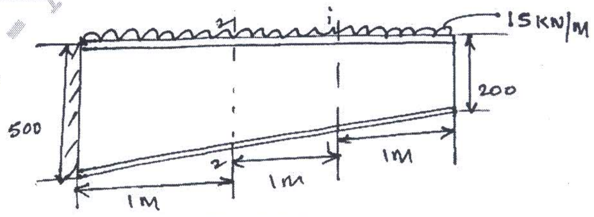

Fig.Q8(b) **(08 Marks)**

Module-5

9 a. Derive and explain about stress analysis in fuselage frames caused due to torsion. **(08 Marks)**

b. Explain about the cut-outs in fuselage structures. **(08 Marks)**

OR

10 The fuselage of the section the bending moment due to self weight was 9.8kNm and due to symmetrical pull out tall load 45.1kNm down. The tail load may be assumed to be acting at 2m away from the section. If the stringers are 16 in number and placed as shown in Fig.Q10, with areas of stringers placed symmetrical about YY axes. Calculate the stress in stringers.

Stringers	Area (mm^2)	x	y
1	640	0	660
2	600	100	600
3	600	200	420
4	600	300	228
5	620	500	25
6	640	450	–204
7	640	300	–396
8	850	150	–502
9	640	0	–540

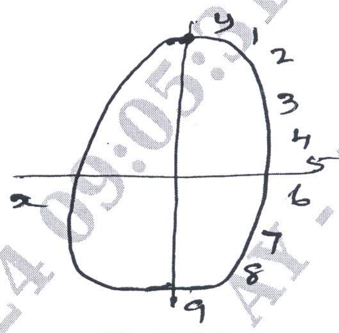

Fig.Q10

(16 Marks)

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