CBCS SCHEME

USN | | | | | | | | | | |

15AE64

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Aircraft Structures – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Derive expression for direct stress for the case of unsymmetrical bending. **(08 Marks)**

b. Write the equilibrium equations for a thin walled beam and derive an expression for shear in open section beam. **(08 Marks)**

OR

2 a. A beam having the cross section shown is subjected to pure bending moment of 1600 Nm. Calculate the maxi direct stress and the point where it acts. **(08 Marks)**

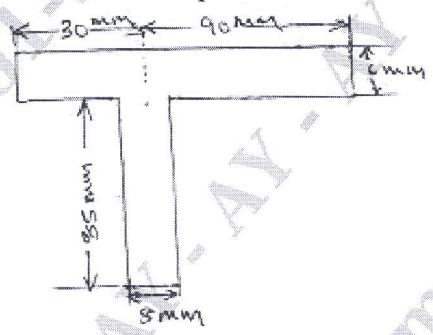


Fig. Q2 (a)

b. Calculate the shear flow and shear centre for a 3-stringer section.

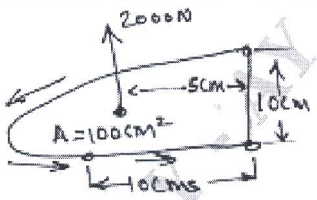


Fig. Q2 (b)

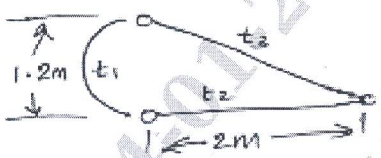
$t_{ab} = 0.08$ cm
$t_{bc} = 0.06$ cms
$t_{ac} = 0.04$ cms
$S_{ab} = 10$ cms
$S_{bc} = 10$ cms
$S_{ac} = 25$ cms

(08 Marks)

Module-2

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

b. If Torque at the section is 3×10^3 Nm. Obtain the shear flow q, maxi shear stress element and its value, rotation θ of the section. Given G = 26.3×10^3 Pa. **(08 Marks)**



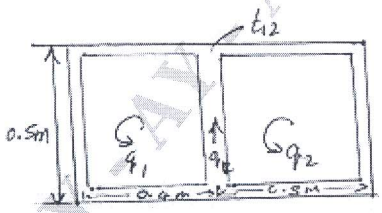
$t_1 = 0.005$ m
$t_2 = t_3 = 0.007$ m

Fig. Q3 (b)

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 **(08 Marks)**



$t_1 = 0.2$ cm
$t_2 = 0.4$ cm
$t_{12} = 0.3$ cm

Fig. Q4 (b)

Module-3

5 a. Discuss the solution of a rectangular plate compressed uniformly by an inplane force N_x° along the edge x = 0 and x = a. **(08 Marks)**

b. Analyse the efficiency of the bolt and lug joint given for the loading, where
Bolt dia =12.5 mm, Bush thickness = 1.6 mm, Material properties :
Applied load = 60 kN, Lug : $F_t = 445$ N/mm^2
Thickness of plate = 14.5 mm, $F_S = 265$ N/mm^2
Width = 35 mm, R = 20 mm, $F_{br} = 675$ N/mm^2
Fas = 1.5, F.F = 1.2, Bearing factor = 2 Bolt bush : $F_S = 515$ N/mm^2
$F_{br} = 1205$ N/mm^2

(08 Marks)

OR

6 a. Explain buckling and crippling stress? Bring out the essential difference between them. **(08 Marks)**

b. A Bracket is supported by means of 4 rivets of same size as shown. Determine the diameter of the rivet if the maximum shear stress is 140 N/mm^2. **(08 Marks)**

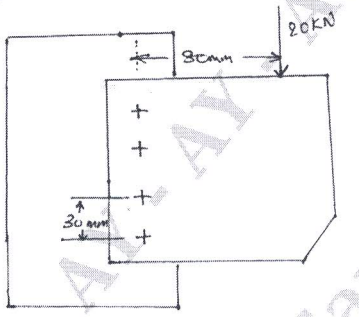


Fig. Q6 (b)

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 mm^2. Depth of flange at AA = 300 mm. **(08 Marks)**

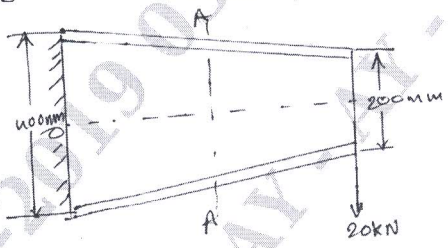


Fig. Q7 (b)

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 mm^3, 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 **(08 Marks)**

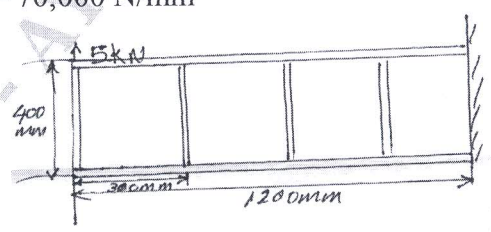


Fig. Q8 (a)

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 mm^2 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. **(08 Marks)**

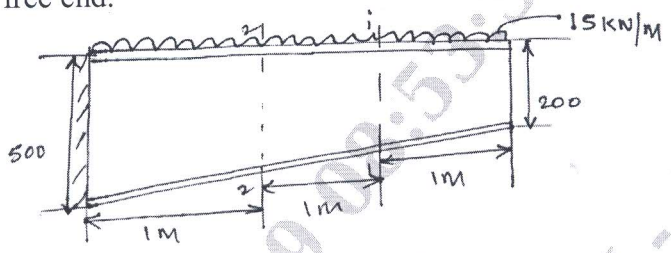


Fig. Q8 (b)

Module-5

9 Explain the concept of tension field beams used in aerospace. **(16 Marks)**

OR

10 At a section of a fuselage the bending moment due to self weight was 9.8 kNm and due to symmetrical pull out tail load is 45.1 kNm. The tail load may be assumed to be acting at 2 m away from the section. If the stringers are 16 in number and placed as shown, with areas of stringers placed symmetrical about yy axis, calculate the stresses in stringers. **(16 Marks)**

Sl. No.	1	2	3	4	5	6	7	8	9
Area	640	600	600	600	620	640	640	850	640
x	0	100	200	300	500	450	300	150	0
y	660	600	420	228	25	-204	-396	-502	-540

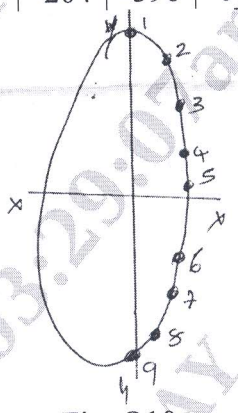


Fig. Q10

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