Code No: **RT42212** **R13** **Set No. 1**

IV B.Tech II Semester Regular/Supplementary Examinations, April - 2018

STRUCTURAL ANALYSIS AND DETAILED DESIGN

(Aeronautical Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Name the phases involved in aircraft design. [3]
   b) Write the advantages of fuselage bulkheads. [3]
   c) What are the applications of finite element matrix methods? [4]
   d) Name the components of a landing with a neat sketch. [4]
   e) Differentiate non-Probabilistic methods and Probabilistic Methods. [4]
   f) Define factor of safety. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain landing gear structure and different types of landing gear configurations. [8]
   b) When the landing gear on a carrier a 44482 N airplane is given a deceleration of 3g (30m/s^2) by means of a cable engaged by an arresting hook as shown in figure (1). then:
      (i) Find the tension in the cable , the wheel reaction R and the distance (e) from the center of gravity to the line of action of the cable
      (ii) Find the landing run if the landing speed is 25m/s^2 [8]

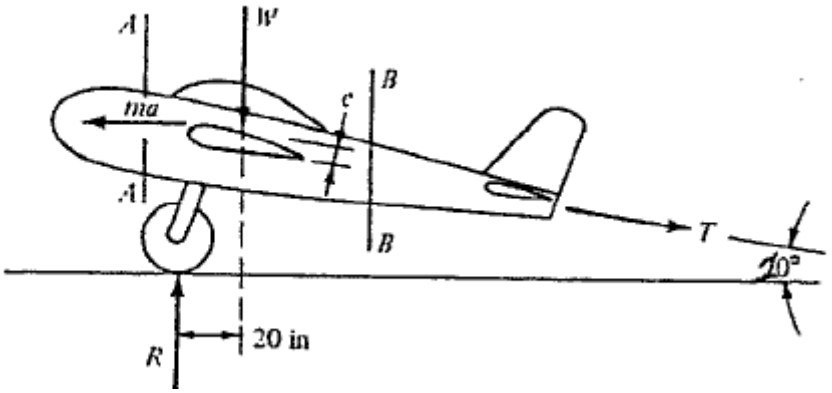

Figure (1)

3. a) The fuselage of a light passenger-carrying aircraft has the circular cross section shown in figure (2). The cross-sectional area of each stringer is 100mm^2, and the vertical distances given in figure are to the midline of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200kNm applied in the vertical plane of symmetry, at this section, calculate the direct stress distribution.

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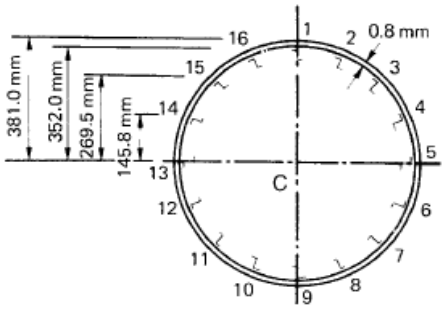

Figure (2) [8]

b) Determine the shear flow distribution in the fuselage section by replacing the applied load by a shear load through the shear center together with a pure torque as shown in figure (3).

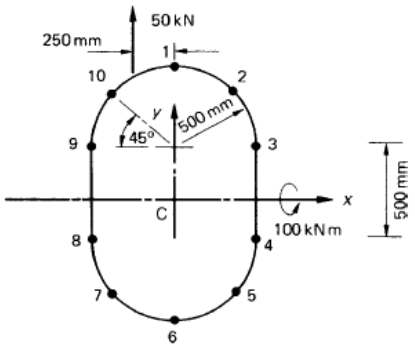

Figure (3) [8]

4. a) Derive exact equations for the forces L and D of figure (4). in terms of L_0, D_0, and α_i. Calculate the percentage error of equations $L=L_0$ and $D=D_0+\alpha_i L_0$ if L/D = 10 and α_i = 0.05 rad.

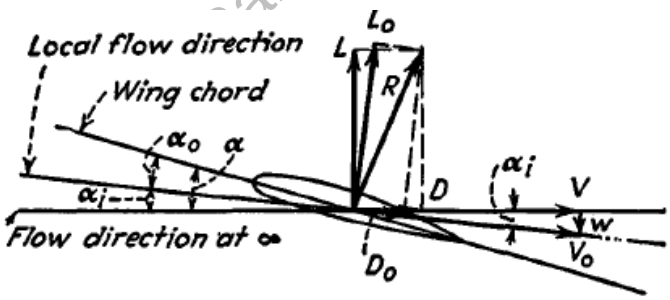

Figure (4) [8]

b) Illustrate the critical conditions for wing box structure. [8]

5. a) Describe the general requirements required for gear acceptable airworthiness. [8]
b) Design an oleo strut landing for an aircraft with a seating capacity of 50 passengers and analyze it using appropriate methods. [8]

6. a) Discuss about model approximations methods. [8]
b) Write the importance of Monte Carlo models in improving design reliability. [8]

7. a) Derive an expression for the criterion of maximum shear stress theory. [8]
b) Explain why shearing is a key mechanism in material failure (yielding) in many cases. [8]