

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

III B.TECH I SEMESTER

***R17 SUPPLEMENTARY
PREVIOUS QUESTION PAPERS***

LIST OF SUBJECTS

<i>CODE</i>	<i>NAME OF THE SUBJECT</i>
R17A2108	Advanced Propulsion Systems
R17A2111	Aircraft Stability and Control
R17A2110	Aerospace Vehicle Structures - II
R17A0325	Composite Materials
R17A2109	High Speed Aerodynamics
R17A0552	Introduction to Java Programming

Code No: **R17A2108****MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY****(Autonomous Institution – UGC, Govt. of India)****III B.Tech I Semester Supplementary Examinations, February 2021****Advanced Propulsion Systems****(AE)**

Roll No									
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Time: 2 hours 30 min**Max. Marks: 70**Answer Any **Five** Questions

All Questions carries equal marks.

- 1 What are the problems of combustion in high-speed flow? Explain the working of scram jet engine. **[14M]**
- 2 Explain the working and operation of Air turbo-rocket (ATR). **[14M]**
- 3 What are the materials used for Rocket motor casing? Write the advantages of cryogenic engines. **[14M]**
- 4 Explain the working principle and applications of Solid propellant rocket motors. **[14M]**
- 5 Explain the following w.r.t. nuclear fission: **[14M]**
 - a) Thermal stability
 - b) Prompt and delayed neutrons.
- 6 Discuss about the safety issues in nuclear propelled missions. **[14M]**
- 7 Explain about the generation of thrust in electric propulsion system. **[14M]**
- 8 Explain the following w.r.t. space launch vehicle: **[14M]**
 - a) Missions
 - b) Mission profile
 - c) Staging employed

Code No: R17A2111

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, February 2021**Aircraft Stability and Control**

(AE)

Roll No									
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Time: 2 hours 30 min

Max. Marks: 70

Answer Any **Five** Questions

All Questions carries equal marks.

- 1 Explain the variation of longitudinal and lateral derivatives with Mach number [14M]
- 2 Explain why deflecting the aileron produces a yawing moment. [14M]
- 3 Derive the expressions for aerodynamic stability and control derivatives. [14M]
- 4 Explain the effect of compressibility on aerodynamic stability. [14M]
- 5 Explain the variation of hinge moment coefficient with α_t and δ_e . [14M]
- 6 Consider an airplane with $W = 22500$ N, $S = 15$ m², aspect ratio = 6, $\bar{c} = 2.50$ m, $l_t = 3\bar{c} = 7.5$ m, $C_{m\delta} = -0.01$ deg⁻¹ and $\tau = 0.5$. Calculate the difference between maneuver point stick-fixed and neutral-point stick-fixed. [14M]
- 7 Explain and derive an expression for stick-free directional stability. [14M]
- 8 Explain about any one of the solutions to the stability quadratic of the linearised equations of motion. [14M]

Code No: R17A2110

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, February 2021

Aerospace Vehicle Structures - II

(AE)

Roll No									
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Time: 2 hours 30 min

Max. Marks: 70

Answer Any **Five** Questions

All Questions carries equal marks.

- 1 A thin square plate of side a and thickness t is simply supported along each edge, and has a slight initial curvature giving an initial deflected shape. [14M]

$$w_0 = \delta \sin \frac{\pi x}{a} \sin \frac{\pi y}{a}$$

If the plate is subjected to a uniform compressive stress σ in the x -direction (figure 1), find an expression for the elastic deflection w normal to the plate.

- 2 A simply supported beam has a span of 2.4m and carries a central concentrated load of 10 kN. The flanges of the beam each have a cross-sectional area of 300mm^2 while that of the vertical web stiffeners is 280mm^2 . If the depth of the beam, measured between the centroids of area of the flanges, is 350mm and the stiffeners are symmetrically arranged about the web and spaced at 300mm intervals, determine the maximum axial load in a flange and the compressive load in a stiffener. It may be assumed that the beam web, of thickness 1.5 mm, is capable of resisting diagonal tension only. [14M]
- 3 Derive the Bredt-Batho formula related to torsion. What are the assumptions made. [14M]
- 4 A structural Aluminum Extruded rectangular cross section of 100 X 250 is shown in Figure 1. Determine the shearing stress in the each of the four walls of the tube, when it is subjected to a torque of 2700 N-m. [14M]

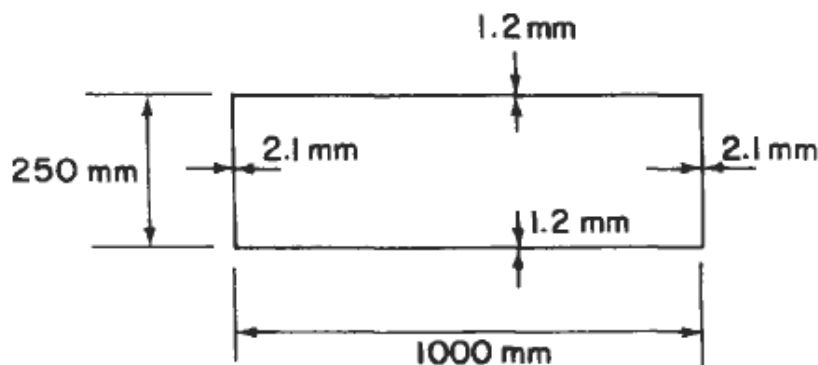


Figure 1

- 5 The thin-walled single cell beam shown in Figure 2 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 10 kN acting in a vertical plane through booms 3 and 6. Calculate the distribution of shear flow around the section. Boom areas: $B_1 = B_8 = 200 \text{ mm}^2$; $B_2 = B_7 = 250 \text{ mm}^2$; $B_3 = B_6 = 400 \text{ mm}^2$; $B_4 = B_5 = 100 \text{ mm}^2$. [14M]

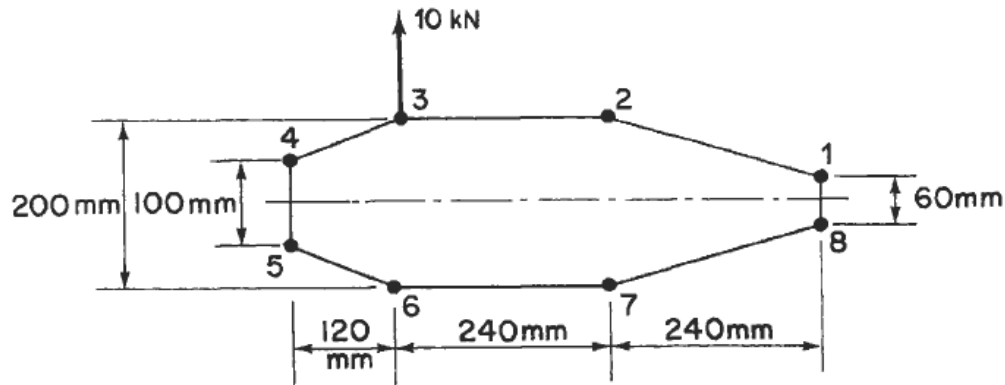


Figure 2

- 6 Figure 3 shows the cross-section of a single cell, thin-walled beam with a horizontal axis of symmetry. The direct stresses are carried by the booms B_1 to B_4 , while the walls are effective only in carrying shear stresses. Assuming that the basic theory of bending is applicable, calculate the position of the shear centre S. The shear modulus G is the same for all walls. Cell area = 135000 mm^2 . Boom areas: $B_1 = B_4 = 450 \text{ mm}^2$, $B_2 = B_3 = 550 \text{ mm}^2$. [14M]

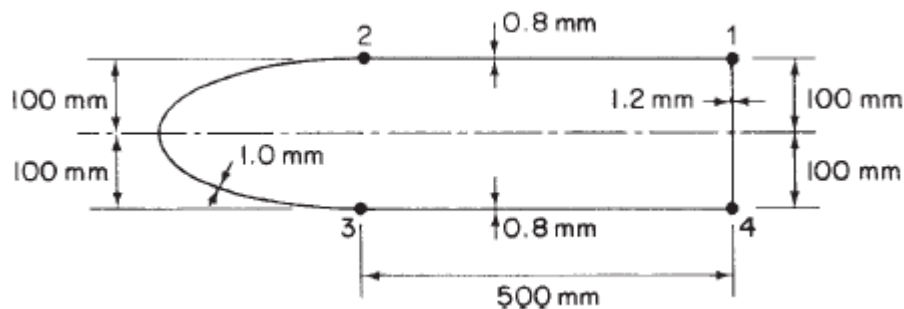


Figure 3

- 7 Derive the expression of the torsion bending constant for an open section beam fully built-in at one end. [14M]
- 8 Explain the methods of improving torsion bending strength by lipping, as an effective means of improving torsion bending constant? [14M]

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
III B.Tech I Semester Supplementary Examinations, February 2021
Composite Materials

(AE)

Roll No										
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Time: 2 hours 30 min

Max. Marks: 70

Answer Any **Five** Questions
 All Questions carries equal marks.

- 1 a). What are metal matrix composites? Give the advantages and drawbacks of metal matrix composites over polymer matrix composites. **[10M]**
 b). List the desired properties of matrix and the reinforcement in a composite material. **[4M]**
- 2 a). State and describe the classification of composites. **[10M]**
 b). What is the different between an alloy and a composite? Explain with examples. **[4M]**
- 3 Explain the filament winding manufacturing process of Polymer Matrix Composites (PMCs) with suitable sketch. **[14M]**
- 4 Discuss the following in manufacturing of Polymer Matrix Composites. **[7+7M]**
 a). Hand layup method
 b). Injection Molding
- 5 a). Find the longitudinal, transverse Young's modulus and in-plane shear modulus of a glass/epoxy lamina with a 70% fiber volume fraction. The properties of glass and epoxy are $E_f = 85 \text{ GPa}$, $E_m = 3.4 \text{ GPa}$, $\nu_f = 0.2$ and $\nu_m = 0.3$. **[10M]**
 b). Explain rule of mixtures to evaluate modulus in longitudinal direction. **[4M]**
- 6 State and explain the various geometric aspects and elastic symmetry of composites. **[14M]**
- 7 Explain various features for the following laminates. **[5+5+4M]**
 a) Cross-ply laminates
 b) Angle-ply laminates
 c) Symmetric laminates

- 8** Discuss the advantages and disadvantages of adhesive and mechanically fastened joints **[14M]**

Code No: **R17A2109****MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY****(Autonomous Institution – UGC, Govt. of India)****III B.Tech I Semester Supplementary Examinations, February 2021****High Speed Aerodynamics****(AE)**

Roll No									
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Time: 2 hours 30 min**Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.

- 1 Derive one dimensional continuity and momentum governing equations. **[14M]**
- 2 a) Explain the relation of speed of sound to compressible flows. **[5M]**
b) Explain about Compressibility, flow regimes and shock waves **[9M]**
- 3 Explain the significance of incident shock and reflected shock with examples. **[14M]**
- 4 a) A uniform supersonic flow encounters a compression corner such that an oblique shock occurs and the flow is deflected by an angle of 20 degrees. Calculate shock angle, pressure, temperature, mach number, stagnation pressure, stagnation temperature downstream of the shock when the upstream values are $M=3$, $p=1$ atm and $T=288K$? **[10M]**
b) Explain about shock polar. **[4M]**
- 5 a) Write the applications of critical Mach number and explain the importance of it in designing a new kind of airfoil. **[7M]**
b) Write brief on Prandtl-Glauert compressibility corrections. **[7M]**
- 6 a) How is the velocity potential defined, and which equations are fulfilled by the velocity potential for compressible flows. **[14M]**
b) Why it is convenient to introduce the velocity potential? Derive velocity potential equation for a subsonic flow.
- 7 a) Why is a convergent divergent nozzle required to expand a flow from stagnation condition to supersonic velocity? **[7M]**
b) Explain the phenomenon of choking and surging in a nozzle. **[7M]**
- 8 Write a note on Scale effects and corrections, wall interferences in flow measurement. **[14M]**

Code No: R17A0552

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, February 2021**Introduction to Java Programming****(EEE, ME, ECE & AE)**

Roll No										
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Time: 2 hours 30 min**Max. Marks: 70**Answer Any **Five** Questions

All Questions carries equal marks.

- 1 A) Illustrate various data types and variables categories in OOP with an example [10M]
 B) Analyze the concept of Buffered Reader class and explain with an example [4M]
- 2 A) Examine the Types and Concepts of Constructors with an example [7M]
 B) Discuss the various categories of Control statements in OOP [7M]
- 3 Explain different types of inheritance in detail ,Mention an example for each type of inheritance [14M]
- 4 Inspect how we can implement interfaces in Java and construct an example for the concept of interfaces [14M]
- 5 A)Write a program to illustrate the use of multiple catch blocks for a try block. [7M]
 B) Explain Thread life cycle. [7M]
- 6 A)What are the uses of 'throw' and 'throws' clauses for exception handling? [7M]
 B) Explain the checked and unchecked exception with an example [7M]
- 7 A) What is the life cycle of applets and explain in detail [7M]
 B) Give an overview of Byte Streams [7M]
- 8 What is the significance of layout managers? Discuss briefly various layout managers. [14M]
