MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

III B.TECH I SEMESTER

R17 SUPPLEMENTARY

PREVIOUS QUESTION PAPERS

LIST OF SUBJECTS

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

Code No: **R17A2108** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2022

Advanced Propulsion Systems

(AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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1	Explain the types of nozzles with neat sketches.	**[14M]**
2	Explain the working principle of ATR with neat sketch	**[14M]**
3	Explain about the different types of Propellant grain structures with neat diagrams	**[14M]**
4	Explain about the different types of liquid feed systems with neat sketches	**[14M]**
5	Explain about the safety issues in nuclear propelled missions	**[14M]**
6	Explain the difference between nuclear fusion and fission chain reactions with examples.	**[14M]**

7	Explain the working principle of plasma thrusters (PPT) for micro-spacecraft	**[14M]**
8	Define mission profile and explain the different types of mission profiles for launch vehicles	**[14M]**

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Code No: **R17A2111** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2022

Aircraft Stability and Control

(AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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1 (i) Explain why the airplane is considered as a dynamic system in six degrees of freedom? **[7M]**

(ii) Distinguish between static and dynamic stability. Graphically represent a system which is statistically stable but dynamically unstable **[7M]**

2 Derive the equations of motion of a rigid body **[14M]**

3 Given a rectangular wing of aspect ratio 6 and area 55.8 m^2. The wing section employed is an NACA 4412 airfoil with aerodynamic centre at 0.24c and Cmac=-0.088. If the wing is balanced so that the c.g. lies on the wing chord but 15cm ahead of the a.c., calculate the following. **[14M]**

(a) The lift coefficient for which the wing would be in equilibrium (Cmcg=0). Is this lift coefficient useful? Is the equilibrium statically stable?

(b) Calculate the position of c.g. for equilibrium at C_L=0.4. Is this equilibrium statically stable?

4 For an airplane the pitching moment co-efficient is given by the following expression when c.g. lies at 0.25 c. $C_{mcg} = 0.05 - 0.10C_L - 0.01\delta e$ where δe is in degrees. Determine the following: **[14M]**

(a) Is the airplane statically stable? Justify.

(b) What is the static margin?

(c) What is the location of neutral point stick fixed?

(d) What is the value of C_L for which equilibrium is achieved with zero elevator deflection?

(e) What is the value of elevator effectiveness ($C_{m\delta}$)?

(f) If the elevator deflection is limited to ± 25º, locate the most forward c.g. location for which trim is obtained at C_L=1.5 in free light.

5 Obtain an expression for elevator control power and hence obtain the elevator angle required for trim condition **[14M]**

6 Briefly explain the following: (i) Effects of releasing the elevator, (ii) Hinge moment parameters, (iii) Limits on the airplane's c.g **[14M]**

7 (i) Briefly explain the effect of dihedral on static lateral stability with neat sketch **[7M]**

(ii) Discuss briefly the contribution of various components of the airplane on static directional stability **[7M]**

8 Describe the following: **[14M]**

i) Short period and long period modes of oscillation of longitudinal motion.

ii) Spiral mode and Dutch roll mode of lateral motion.

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Code No: **R17A2110** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2022

Aerospace Vehicle Structures - II

(AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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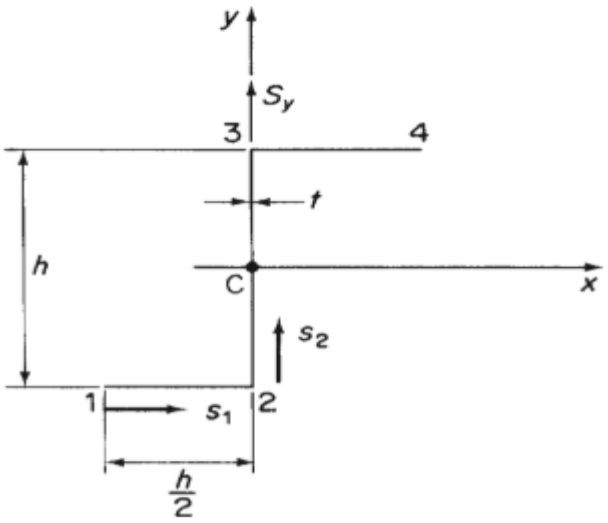
1 Discuss the thin rectangular plates subject to bending and twisting with neat sketches. **[14M]**

2 What is meant by structural instability? Explain in detail the semi diagonal tension field beam with a neat sketch. **[14M]**

3 Determine the shear flow distribution in the thin-walled Z-section shown in figure due to a shear load Sy applied through the shear centre of the section. **[14M]**



4 (i) Discuss the steps involve in deriving the shear flow of a closed section beam. **[7M]**

(ii) Derive Bredt-Batho formula and explain displacements associated with the Bredt- Batho shear flow. **[7M]**

5 The fuselage of a light passenger carrying aircraft has the circular cross-section shown in Fig. The cross-sectional area of each stringer is 100 mm^2 and the vertical distances given in Fig. (a) are to the mid-line of the section wall at the corresponding stringer position. If the fuselage is subjected to a bending moment of 200 kNm applied in the vertical plane of symmetry, at this section, calculate the direct stress distribution. **[14M]**

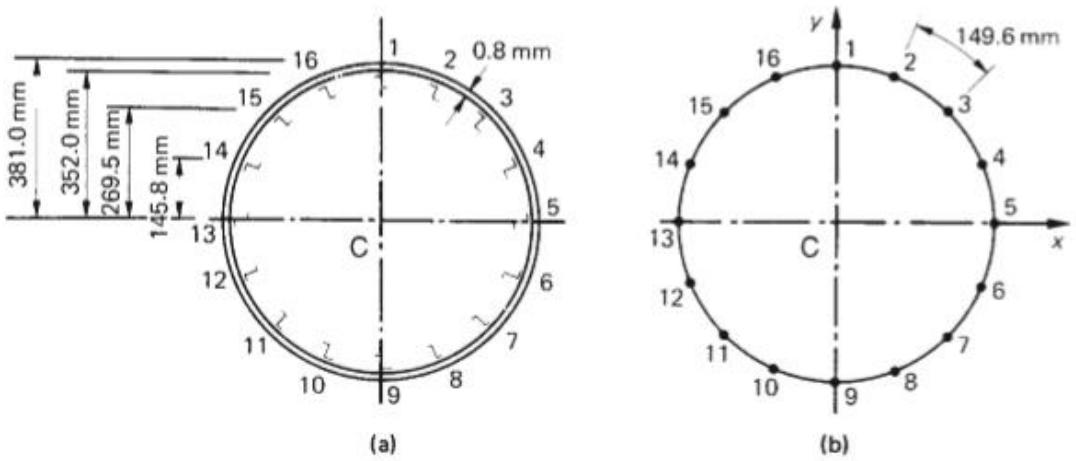
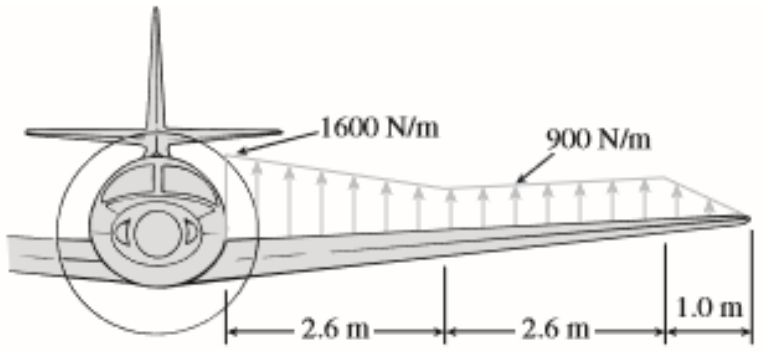
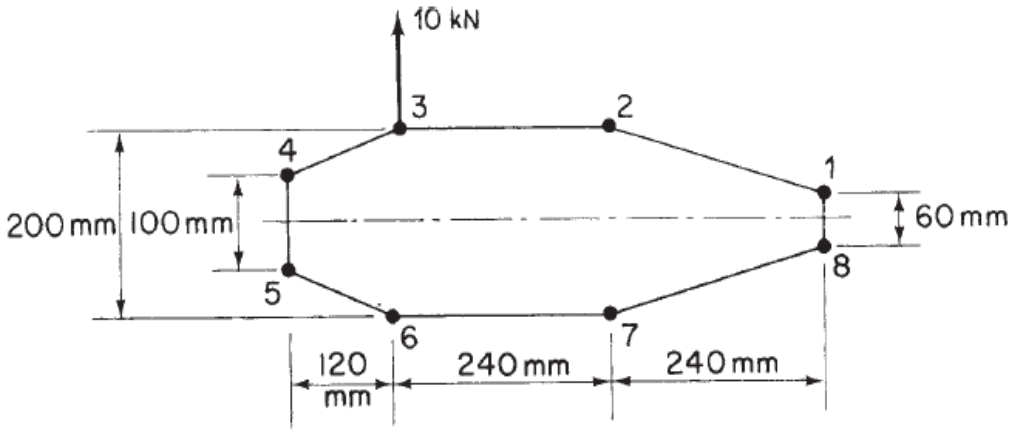


Fig. (a) Actual fuselage section; (b) idealized fuselage section.

6 Under cruising conditions the distributed load acting on the wing of a small airplane has the idealized variation shown in the figure. Calculate the shear force V and bending moment M at the inboard end of the wing. **[14M]**



7 The thin-walled single cell beam shown in Fig. 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 (or) stringer areas: $B1 = B8 = 200\ mm^2$, $B2 = B7 = 250\ mm^2$, $B3 = B6 = 400\ mm^2$, $B4 = B5 = 100\ mm^2$. **[14M]**



8 With neat sketches, explain the functions of structural components of an aircraft wing and fuselage **[14M]**

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Code No: **R17A0325** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2022

Composite Materials

(AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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1 (a) What is meant by composite material? Where and why are composite materials used? **[7M]**

(b) List the applications of the following composites:
i) Aircraft ii) Automobile iii) Marine and iv) Sports equipments. **[7M]**

2 (a) Explain clearly the role of a matrix and reinforcement in polymer matrix composite. **[7M]**

(b) What are the advantages of ceramics over metals as fibers? **[4M]**

(c)What is a composite fiber? Give examples. **[3M]**

3 (a) Explain the spray lay-up process with the help of neat sketch. **[7M]**

(b) Write the applications of hand lay-up process. **[7M]**

4 (a)Discuss the production of glass fibers in detail using a neat sketch. **[7M]**

Give the composition of E glass and S glass.

(b) Compare the properties of metals, ceramics and polymers as matrix materials **[7M]**

5 (a) Prove that $E1 = E_fV_f + EmVm$ from the rule of mixtures. Also write the assumptions. **[7M]**
(b) Explain rule of mixtures to evaluate modulus in longitudinal direction

[7M]

6 (a) Determine the modulus of elasticity of a FRP on the fiber direction (E1) and in the transverse direction (E2) with proper representative sketches. **[7M]**
(b) Define the terms volume fraction and mass fraction.

[7M]

7 Explain the below terms:

(i) symmetric laminate **[5M]**
(ii) cross-ply laminate
(iii) angle-ply laminate **[5M]**

[4M]

8 (a) Briefly explain the failure modes of the mechanical joints. **[7M]**
(b) Write the advantages and disadvantages of mechanical joints

[7M]

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Code No: **R17A2109** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

III B.Tech I Semester Supplementary Examinations, June 2022

High Speed Aerodynamics

(AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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1	(i) Illustrate different regimes of compressible flow by considering an aerodynamic body in a flowing gas.	**[7M]**
	(ii) A normal shock wave is standing in the test section of a supersonic wind tunnel. Upstream of the wave, $M_1 = 3$, $p_1 = 0.5$ atm, and $T_1 = 200$ K. Find M_2, p_2, T_2 and u_2 downstream of the wave.	**[7M]**
2	Derive the Prandtl's relation for flow across a normal shock and explain its significances.	**[14M]**
3	(i) For a Prandtl- Meyer expansion, the upstream Mach number is 2 and the pressure ratio across the fan is 0.5. Determine the angles of the front and end Mach lines of the expansion fan relative to the free stream.	**[7M]**
	(ii) Consider a Mach 2.8 supersonic flow over a compression corner with a deflection angle of 15°. If the deflection angle is doubled to 30°, what is the increase in shock strength? Is it also doubled?	**[7M]**
4	Obtain an expression for θ–β-M relation for oblique shocks and also graphically	**[14M]**

represent the θ –β-M relation.

5 Based on small perturbation theory, derive the linearized velocity potential equation for compressible flows. State the assumptions. **[14M]**

6 (i) What is supercritical airfoil? Explain how the critical Mach number is increased **[7M]**

(ii) What is the need for sweep back for wing of high speed aircraft? Explain two important characteristics of swept back wings. **[7M]**

7 What is meant by Quasi one dimensional flow? Derive an expression for area-velocity relation of a convergent-divergent duct. **[14M]**

8 Describe the types of wind tunnel balances. What are the six components measured by the wind tunnel balances? Explain how these are measured. **[14M]**

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Code No: **R17A0552**

R17

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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III B.Tech I Semester Supplementary Examinations, June 2022

Introduction to Java Programming

(ME, ECE & AE)

Roll No										

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

Answer Any **Five** Questions

All Questions carries equal marks.

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1 Explain any five object oriented features supported by java with examples. Explain about Object class in detail. **[14M]**

2 What is an array? Why arrays are easier to use compared to a bunch of related variables? Write a program for transposition of a matrix using arraycopy command. **[14M]**

3
a. Explain abstract class with a suitable example. **[5M]**
b. Explain various types of inheritances with suitable examples. **[9M]**

4 What is a package? How do we design a package? How do we add a class or interface to a package? **[14M]**

5	Compare checked , unchecked exceptions and built in exceptions? Write a program that creates a user interface to perform integer division. The user enters two numbers through command line arguments as Num1 and Num2, perform division and returns the remainder. If Num1 and Num2 are not integers, then Number Format Exception has to be generated. If Num2 is Zero, Arithmetic Exception has to be generated.	**[14M]**
6	How multithreading in single processor system is different from multithreading in multiprocessor system. Explain with good programming examples.	**[14M]**
7	Differentiate between applets and applications. Draw and Explain the life cycle of an applet	**[14M]**
8	Write the Major limitations of AWT compare and contrast Swing vs AWT.	**[14M]**

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