MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

IV B.TECH I SEMESTER

R17 SUPPLEMENTARY PREVIOUS QUESTION PAPERS

LIST OF SUBJECTS

CODE	NAME OF THE SUBJECT
R17A2122	Aircraft Maintenance Engineering
R17A2120	Airframe Structural Design
R17A2121	Avionics
R17A2119	Computational Aerodynamics
R17A0323	CAD/CAM
R17A0368	Mechanical Vibrations and Structural Dynamics

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

IV B.Tech I Semester Supplementary Examinations, June 2022

Aircraft Maintenance Engineering

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

R17

Answer Any Five Questions

All Questions carries equal marks.

1	Explain the role of an engineer and a mechanic in aircraft maintenance.	[14M]
2	Discuss the maintenance steering group (MSG) approach in aircraft maintenance management with the help of line diagram.	[14M]
3	Describe in detail managerial level functions in technical services and overhaul shops.	[14M]
4	(i) Compare Manufacturer`s documentation, Regulatory documentation and Airline generated documentation	[7M]
	(ii) Compare Aircraft certification and Operator certification	[7M]
5	(i) Discuss the forecasting, production planning, and production control	[6M]

	(ii) Explain the functions of technical publications						
6	i. ii. iii.	Discuss bath tub curve with a neat sketch Briefly emphasis on air crash worthiness program Explain pilot flying handling qualities	[4M] [4M] [6M]				
7	What are hangar ma	the problem areas of hangar maintenance? Explain the organization of intenance.	[14M]				
8	Briefly exp (i) Quality (ii) Quality (iii) Quality	lain the following: Assurance / audits / control.	[4M] [5M] [5M]				

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IV B.Tech I Semester Supplementary Examinations, June 2022

Airframe Structural Design

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

Answer Any Five Questions

All Questions carries equal marks.

- **1** Discuss briefly the design procedures design criteria, aircraft load considered in **[14M]** structural design of aircraft .
- 2 Explain the principal structural components of aircraft and its functions with neat [14M] sketches
- **3** Discuss in detail the design consideration of rivets, bolts, screws, and nuts. **[14M]**
- 4 (i) Define Stress concentration. Explain its causes and methods of reduction [7M]
 (ii) Write a brief note on Shim control and requirement [7M]
- **5** What are problems with swept wings? Explain in detail wing root joints and carry **[14M]** through structure.

6	Explain the various considerations and steps involved in the main wing design with neat sketches	[14M]
7	Discuss in detail the purpose, types and general arrangement of aircraft landing gear.	[14M]
8	Briefly explain the following:	
	(i) Fatigue design philosophy	[5M]
	(ii) Scatter factor	[4M]
	(iii) Modes of failure	[5M]

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IV B.Tech I Semester Supplementary Examinations, June 2022

Avionics

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

Answer Any Five Questions

All Questions carries equal marks.

1	(i) Discuss the message format of ARINC 629 data bus	[7M]
	(ii) Explain the word format of MIL-STD-1553B data bus in detail	[7M]
2	Explain the detailed process for developing an avionics system for a military aircraft starting from mission requirements to system testing.	[14M]
3	Compare VHF communication systems and UHF communication systems.	[14M]
4	(i) Explain the operation of satellite communication in aircraft	[7M]
	(ii) Discuss the Flight data recorders	[7M]

5	Describe the working principle of stable platform system and strap down system.	[14M]
6	(i) Describe the principles of optical gyroscope and ring laser gyros (ii) Define: Speed of sound, Mach Number, CAS, TAS.	[10M] [4M]
7	Explain the principles of navigation. Discuss the types of navigation systems in detail.	[14M]
8	Explain the working principle of Instrument Landing System with a neat sketch	[14M]

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IV B.Tech I Semester Supplementary Examinations, June 2022

Computational Aerodynamics

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

Answer Any Five Questions

All Questions carries equal marks.

1 (i) What is meant by CFD? Discuss its importance as research and design tool [7M]

(ii) Differentiate between finite control volume and infinitesimal fluid element [7M] approach

- 2 Discuss the general procedure of CFD and its application to various engineering [14M] problems
- **3** Distinguish between conservation and non-conservation forms of fluid flow. **[14M]** Derive the continuity equation for inviscid flow in partial differential non-conservation form
- 4 (i) Comment on the governing equations of CFD [7M]

(ii) Explain the classification of quasi-linear partial differential equation [7M]

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5	Discuss the properties of discretization schemes and explain upwind discretization applied to FVM.	[14M]
6	(i) Briefly explain Cell Centered and Cell Vertex formulation (ii) Briefly describe Discretization and round-off errors?	[7M] [7M]
7	(i) Differentiate between structured and unstructured grids (ii) Explain the types of grids used in FVM	[7M] [7M]

8 Discuss the SIMPLE algorithm and boundary conditions for the pressure correction [14M] method.

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IV B.Tech I Semester Supplementary Examinations, June 2022

CAD/CAM

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

Answer Any Five Questions

All Questions carries equal marks.

Explain the concept of various co ordinate systems required for geometric [14M] display systems. Give an example?

2 Discuss the concept of obtaining a rotation about an arbitrary point in XY plane? [14M]

- **3** What are the primitive elements in CAD? Give the classification of geometric **[14M]** modeling systems based on their capabilities?
- **4** Explain the constructive solid geometry for the representation of solids? **[14M]** Modeling?
- 5 Explain about various modes of NC machine with example. [14M]

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6 The component to be machined is shown in figure. Write a program using canned **[14M]** cycles to drill all the holes shown in figure.



- 7 What are the part families? What are the methods used for grouping of parts? [14M]
- 8 What is meant by CIM? Illustrate the importance of CIM in modern manufacturing [14M] systems.

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IV B.Tech I Semester Supplementary Examinations, June 2022

Mechanical Vibrations & Structural Dynamics

(AE)

Roll No					

Time: 3 hours

Max. Marks: 70

Answer Any Five Questions

All Questions carries equal marks.

- **1** Explain: (i) Degree of freedom, (ii) Simple harmonic motion and (iii) D' **[14M]** Alembert's Principle
- 2 Discuss in detail classification of vibrations and procedure of vibration analysis. [14M]
- 3 A vertical single stage air compressor having a mass of 500 kg is mounted on [14M] springs having a stiffness of 1.96×10^5 N/m and a damping coefficient of 0.2. The rotating parts are completely balanced and the equivalent reciprocating parts weigh 20 kg. The stroke is 0.2 m. Determine the dynamic amplitude of vertical motion and the phase difference between the motion and excitation force if the compressor is operated at 200 rpm.
- 4 (i) What are the causes of vibration? Differentiate between free and forced [7M] vibration.

(ii) Find the natural frequencies of car with the following conditions: Total mass of car = **[7M]** 300kg, wheel base=3m, CG is 1.5m from front axle, radius of gyration is 1m. Spring constants of front and rear springs are 70×10^3 N/m each.



Find the natural frequencies of the system shown in Fig., with m₁= m, m₂= 2m, k₁= k, [14M] k₂= 2k. Determine the response of the system when k=1000 N/m, m=20kg, and the initial values of the displacements of the masses m₁ and m₂ are 1 and -1, respectively.



6 An airfoil of mass m and mass moment of inertia *lc* about the mass centre C is put for [14M] testing in a wind tunnel. Derive the differential equations of motion.



7 Determine the natural frequencies and mode shapes of the system shown in figure, by [14M] matrix iteration method.



8 Derive the frequency equation of longitudinal vibrations for a free–free beam with zero [14M] initial displacement.