# MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY DEPARTMENT OF AERONAUTICAL ENGINEERING 

IV B.TECH I SEMESTER

R17 SUPPLEMENTARY PREVIOUS QUESTION PAPERS

| 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 |

# 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 |  |  |  |  |  |  |  |  |  |  |
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## Time: 3 hours

Max. Marks: 70

## Answer Any Five Questions

All Questions carries equal marks.

1 Explain the role of an engineer and a mechanic in aircraft maintenance.

2 Discuss the maintenance steering group (MSG) approach in aircraft maintenance management with the help of line diagram.

3 Describe in detail managerial level functions in technical services and overhaul shops.

4 (i) Compare Manufacturer’s documentation, Regulatory documentation and Airline generated documentation
(ii) Compare Aircraft certification and Operator certification
(ii) Explain the functions of technical publications

6
i. Discuss bath tub curve with a neat sketch
ii. Briefly emphasis on air crash worthiness program
iii. Explain pilot flying handling qualities

7 What are the problem areas of hangar maintenance? Explain the organization of [14M] hangar maintenance.

8 Briefly explain the following:
(i) Quality Assurance
(ii) Quality audits
(iii) Quality control.

# MALLA REDDY COLLEGE OF ENGINEERING \& TECHNOLOGY 

(Autonomous Institution - UGC, Govt. of India)
IV B.Tech I Semester Supplementary Examinations, June 2022

## Airframe Structural Design

(AE)

| Roll No |  |  |  |  |  |  |  |  |  |
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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 structural design of aircraft .

2 Explain the principal structural components of aircraft and its functions with neat sketches

3 Discuss in detail the design consideration of rivets, bolts, screws, and nuts.

4 (i) Define Stress concentration. Explain its causes and methods of reduction
(ii) Write a brief note on Shim control and requirement

5 What are problems with swept wings? Explain in detail wing root joints and carry through structure.

6 Explain the various considerations and steps involved in the main wing design with neat sketches

7 Discuss in detail the purpose, types and general arrangement of aircraft landing gear.

8 Briefly explain the following:
(i) Fatigue design philosophy
(ii) Scatter factor
(iii) Modes of failure

# MALLA REDDY COLLEGE OF ENGINEERING \& TECHNOLOGY 

(Autonomous Institution - UGC, Govt. of India)
IV B.Tech I Semester Supplementary Examinations, June 2022
Avionics
(AE)

| Roll No |  |  |  |  |  |  |  |  |  |
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Time: 3 hours

Answer Any Five Questions
All Questions carries equal marks.

1 (i) Discuss the message format of ARINC 629 data bus
(ii) Explain the word format of MIL-STD-1553B data bus in detail

2 Explain the detailed process for developing an avionics system for a military [14M] aircraft starting from mission requirements to system testing.

3 Compare VHF communication systems and UHF communication systems.

4
(i) Explain the operation of satellite communication in aircraft
(ii) Discuss the Flight data recorders

5 Describe the working principle of stable platform system and strap down system.

6 (i) Describe the principles of optical gyroscope and ring laser gyros
(ii) Define: Speed of sound, Mach Number, CAS, TAS.
[4M]

7 Explain the principles of navigation. Discuss the types of navigation systems in detail.

8 Explain the working principle of Instrument Landing System with a neat sketch

# MALLA REDDY COLLEGE OF ENGINEERING \& TECHNOLOGY 

(Autonomous Institution - UGC, Govt. of India)

# IV B.Tech I Semester Supplementary Examinations, June 2022 <br> Computational Aerodynamics 

(AE)

| Roll No |  |  |  |  |  |  |  |  |  |  |
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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
(ii) Differentiate between finite control volume and infinitesimal fluid element approach

2 Discuss the general procedure of CFD and its application to various engineering problems

3 Distinguish between conservation and non-conservation forms of fluid flow. [14M] Derive the continuity equation for inviscid flow in partial differential nonconservation form

4
(i) Comment on the governing equations of CFD
(ii) Explain the classification of quasi-linear partial differential equation

5 Discuss the properties of discretization schemes and explain upwind discretization [14M] applied to FVM.

6 (i) Briefly explain Cell Centered and Cell Vertex formulation
(ii) Briefly describe Discretization and round-off errors?

7 (i) Differentiate between structured and unstructured grids
(ii) Explain the types of grids used in FVM

8 Discuss the SIMPLE algorithm and boundary conditions for the pressure correction method.

# MALLA REDDY COLLEGE OF ENGINEERING \& TECHNOLOGY 

(Autonomous Institution - UGC, Govt. of India)
IV B.Tech I Semester Supplementary Examinations, June 2022
CAD/CAM
(AE)

| Roll No |  |  |  |  |  |  |  |  |  |  |
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## Time: 3 hours

Max. Marks: 70

## Answer Any Five Questions

All Questions carries equal marks.

1 Explain the concept of various co ordinate systems required for geometric display
systems. Give an example?
2 Discuss the concept of obtaining a rotation about an arbitrary point in XY plane?
3 What are the primitive elements in CAD? Give the classification of geometric 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.

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


7 What are the part families? What are the methods used for grouping of parts?

8 What is meant by CIM? Illustrate the importance of CIM in modern manufacturing systems.

# MALLA REDDY COLLEGE OF ENGINEERING \& TECHNOLOGY 

(Autonomous Institution - UGC, Govt. of India)
IV B.Tech I Semester Supplementary Examinations, June 2022
Mechanical Vibrations \& Structural Dynamics
(AE)

| Roll No |  |  |  |  |  |  |  |  |  |  |
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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 springs having a stiffness of $1.96 \times 10^{5} \mathrm{~N} / \mathrm{m}$ 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 vibration.
(ii) Find the natural frequencies of car with the following conditions: Total mass of car = 300 kg , wheel base $=3 \mathrm{~m}, \mathrm{CG}$ is 1.5 m from front axle, radius of gyration is 1 m . Spring constants of front and rear springs are $70 \times 10^{3} \mathrm{~N} / \mathrm{m}$ each.


5 Find the natural frequencies of the system shown in Fig., with $m_{1}=m, m_{2}=2 m, k_{1}=k$, $\mathrm{k}_{2}=2 \mathrm{k}$. Determine the response of the system when $\mathrm{k}=1000 \mathrm{~N} / \mathrm{m}, \mathrm{m}=20 \mathrm{~kg}$, and the initial values of the displacements of the masses $m_{1}$ and $m_{2}$ are 1 and -1 , respectively.


An airfoil of mass $m$ and mass moment of inertia $I c$ about the mass centre $C$ is put for 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.

