# MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

# DEPARTMENT OF AERONAUTICAL ENGINEERING

IV B.TECH I SEMESTER

**R17 REGULAR** 

**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 & Structural Dynamics

**R17** Code No: R17A2122 MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY (Autonomous Institution – UGC, Govt. of India) **IV B.Tech I Semester Regular Examinations, February 2021 Aircraft Maintenance Engineering** (AE) **Roll No** Time: 2 hours 30 min Max. Marks: 70 Answer Any Five Questions All Questions carries equal marks. Explain in detail about establishing a maintenance program in aircraft industry. 1 [14M] 2 Explain maintenance steering group (MSG) approach in steps in aircraft [14M] maintenance management with the help of line diagram 3 Outline and briefly explain the aviation maintenance programme [14M] 4 Explain in detail the managerial functions of overhaul shops directorate. [14M] 5 Explain about multiple checks in production planning [14M] Explain about the airframe manufacturers training course and airline 6 [14M] maintenance training. 7 Explain about Maintenance Control Center responsibilities. [14M] 8 What are the elements of reliability program? Explain in brief about safety regulations. [14M]

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**R17** Code No: R17A2120 MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY (Autonomous Institution – UGC, Govt. of India) **IV B.Tech I Semester Regular Examinations, February 2021 Airframe Structural Design** (AE) **Roll No** Time: 2 hours 30 min Max. Marks: 70 Answer Any Five Questions All Questions carries equal marks. 1 Explain in detail the principal structural components of wing and fuselage with [14M] neat figures. Explain in detail the external loads acting on aircraft with the help of figures. 2 [14M] 3 Explain in detail the fasteners used in aircraft industry and their role in [14M] maintaining the airframe requirements Explain with neat sketches the theories of failure with required definitions 4 [14M] 5 Explain in detail the following: [7M] (a) Wing loads [7M] (b) Wing box Explain in detail the structural design considerations of the following control surfaces: 6 [5M] (a) Elevator [5M] [4M] (b) Rudder (c) Vertical tail 7 Explain about various support structures in landing gear and discuss about wheels [14M]

8 Explain about fail safe and safe life features in fatigue design. [14M] \*\*\*\*\*\*\* **R17** Code No: R17A2121 MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY (Autonomous Institution – UGC, Govt. of India) **IV B.Tech I Semester Regular Examinations, February 2021 Avionics** (AE) **Roll No** Time: 2 hours 30 min Max. Marks: 70 Answer Any Five Questions All Questions carries equal marks. 1 (a) Illustrate the function of ARINC and MIL-STD-1553 B data bus. [7M] (b) Discuss how various avionics systems are interfaced with the pilot. [7M] 2 Explain the requirement of Avionics equipment and systems with respect to (a) Environment [7M] (b) Reliability [7M] 3 (a) Explain Head down displays in military fighter aircraft cockpit. [7M] (b) With the help of a neat diagram, explain the principle of radio voice [7M] communication. (a) Explain the principle of satellite communications. 4 [7M] (b) Explain the functioning of data recorder systems in an aircraft. [7M] (a) Explain the display systems in modern military aircraft. 5 [7M] (b) Discuss the purpose and functioning of differential GPS. [7M] (a) What are the sources of errors in inertial systems? Explain. 6 [7M] (b) Explain the principle of micro electro-mechanical systems (MEMS) [7M] technology rate gyros.

7	(a) Explain the principle of strap down INS computing.	[7M]
	(b) Explain the functioning of glide - slope and marker systems in ILS.	[7M]
8	Write short notes on	[7M]
	(a) TCAS	[7M]
	(b) EGPWS	

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Code No: R17A2119

### MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

**R17** 

#### (Autonomous Institution – UGC, Govt. of India)

#### IV B.Tech I Semester Regular Examinations, February 2021

#### **Computational Aerodynamics**

(AE)



Answer Any Five Questions

All Questions carries equal marks.

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Explain the general procedure of CFD. Describe how significant is CFD in 1 [14M] present aeronautical industry? Write about difference between analytical, experimental and computational 2 [14M] study of fluid dynamics. Explain the impact of CFD in present research fields with an example. Explain the procedure to find the mathematical behaviour of partial differential 3 [14M] equation using Cramer's rule method with an example of linearized velocity potential equation for subsonic and supersonic case and its effect on CFD? Derive Navier-Stokes equations in non-conservative, differential form. 4 [14M] Derive finite difference schemes for the following partial differential equations 5 and indicate their order of accuracy: [4M] (a)  $\left(\frac{\partial u}{\partial t}\right) + a\left(\frac{\partial u}{\partial x}\right) = 0$  $(\partial u)$   $(\partial^2 u)$ 

(b) 
$$\left(\frac{\partial u}{\partial t}\right) = a \left(\frac{\partial u}{\partial x^2}\right)$$
 [5M]

(c) 
$$\left(\frac{\partial u}{\partial x^2}\right) + \left(\frac{\partial u}{\partial y^2}\right) = 0$$
 [5M]

6	What are the types of discretization techniques and their advantages over other? Explain the discretization of higher order derivatives and how to increase its	[14M]
7	<ul> <li>a) Explain suitable grid for moving body problems and grid quality parameters with neat sketches.</li> <li>(b) Delaunay triangulation grid generation</li> </ul>	[7M] [7M]
8	Explain MacCormack's explicit finite difference technique and discuss its advantage over Lax-Wendroff method.	[14M]

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Code No: R17A0323

#### MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

#### (Autonomous Institution – UGC, Govt. of India)

#### IV B.Tech I Semester Regular Examinations, February 2021

# CAD/CAM

(AE)



Time: 2 hours 30 min

Max. Marks: 70

**R17** 

Answer Any Five Questions

All Questions carries equal marks.

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1	a) Describe about CAD/CAM input devices in detail with specific advantages.	[14M]		
2	<ul><li>b) Explain the CAD/CAM softwares with specific applications in detail.</li><li>a)What is the need for concatenation of transformations</li><li>b) What is Design Process? Explain benefits of CAD and CAD Tools.</li></ul>	[14M]		
3	Explain parametric representation of cubic and Bezier curve and discuss their continuity	[14M]		
4	a)What are surface entities?	[14M]		
	b)Explain with example how axisymmetric and tabulated cylinder surfaces are composed			
5	a)What are advantages & disadvantages of NC?	[14M]		
	b) What are the advantages of DNC over NC/CNC			
6	Explain the structure of CNC machine tools and their applications.	[14M]		
7	Explain briefly about the Retrieval type and Generative type with examples	[14M]		
8	Briefly explain about the contact inspection methods with examples	[14M]		
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Code No: **R17A0368** 

## MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R17

#### (Autonomous Institution – UGC, Govt. of India)

#### IV B.Tech I Semester Regular Examinations, February 2021

#### **Mechanical Vibrations & Structural Dynamics**

(AE)



Time: 2 hours 30 min

Answer Any Five Questions

All Questions carries equal marks.

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1	Write short notes on the following:	[8M]
	<ul><li>(a) Types of vibration with examples</li><li>(b) Harmonic analysis</li></ul>	[6M]
2	<ul> <li>(a) Consider a pendulum of length 1 unit and mass m kg, is restricted to one plane only. Derive natural frequency by: (i) Newtons second law of motion (ii) Energy method</li> </ul>	[8M]
	(b) Determine the natural frequency of the spring mass system considering the inertial effect of the spring.	[6M]
3	<ul> <li>(a) Derive the frequency response relation for a single degree of freedom system subjected to harmonic excitation. Also plot the frequency response diagram.</li> <li>(b) The damped natural frequency of a system is 10.5 Hz. When the system is subjected to a harmonic excitation the maximum amplitude of oscillations occurs at 9.5 Hz. Find the amplitude ratio when it is excited at 15 Hz</li> </ul>	[7M]
	frequency?	[7M]
4	(a) Derive the frequency response relation for base excitation.	[6M]
	(b) A vehicle of mass 400 kg, total spring constant of its suspension 500 N/cm	[8M]
	and the damping factor 0.2 moves over.a road which may be approximatedtoa sine	

i) the critical speed of the vehicle

ii) the amplitude of the steady state motion at the critical speed and

iii) the amplitude of the vehicle when it is driven at a speed 1.5 times more than the' critical speed.

- (a) Derive the equations of motion for a two-rotor system and frequency is evaluated from those equations. [7M]
  - (b) Find the natural frequency of the two-rotor system shown in figure. Also [7M] locate the position of the node with respect to the rotor A. G = 70 GPa.



MIMIN

6 Determine the equations of motion and the natural frequencies of the two

degree freedom spring-mass system shown in figure below.

gree freedom spring-mass system shown in figure below.

7 Using matrix iteration find the frequency of the system shown in the figure below:



8 Derive expression for governing differential equation for torsional vibration of circular or uniform shafts. [14M]

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[14M]