MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF AERONAUTICAL ENGINEERING

II B.TECH I SEMESTER

R17 SUPPLEMENTARY

PREVIOUS QUESTION PAPERS

LIST OF SUBJECTS

CODE	*NAME OF THE SUBJECT*
R17A0206	Electrical and Electronics Engineering
R17A2101	Introduction to Aerospace Engineering
R17A0362	Mechanics of Fluids
R17A0363	Mechanics of Solids
R17A0364	Thermodynamics

R17

Code No: R17A0206

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, February 2021

Electrical and Electronics Engineering

(ME&AE)

Roll No										

Time: 2 hours 30 min **Max. Marks: 70**

Answer Any **Five** Questions

All Questions carries equal marks.

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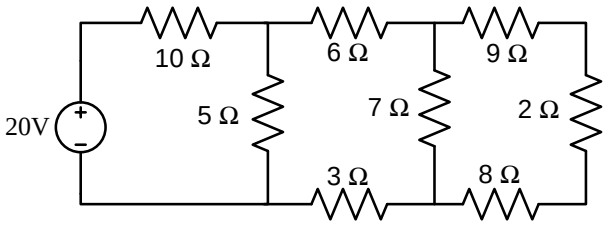
1 a) State Kirchhoff's Laws?

b) Determine the current in the Resistor R = 2Ω



[4+10M]

2 a) Write the equations of star-to-delta Transformation and delta-star transformation?

b) Explain the constructional details and working principle of moving Iron instruments

[7+7M]

3 a) Explain the Swinburne's Test? **[4+5+5M]**
b) Explain the flux speed control of DC shunt

c) Derive EMF equation of a D.C. machine.

4 a) A 30 kW, 300 V, DC shunt generator has armature and field resistance of 0.05Ω and 100 Ω respectively. Calculate the total power developed by the armature when it delivers full load output

b) Explain and draw characteristic of dc series and dc shunt motor **[7+7M]**

5 a) What are the various losses in a transformer?

b) Explain in detail O.C and S.C. tests of a single-phase transformer with neat circuit diagrams. Also explain how equivalent parameters and efficiency can be evaluated by these tests. **[4+10M]**

6 a) Explain the torque – slip characteristics of 3-phase induction Motor? **[7+7M]**

b) Explain the regulation and efficiency of the transformer?

7 a) Explains the working principle of 1-Φ full wave bridge rectifier and also draws the relevant waveforms. **[10+4M]**

b)What are the applications of 1- Φ full wave bridge rectifier

8 Explain the construction and principle of working of the CRO? **[14M]**

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Code No: **R17A2101** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, February 2021

Introduction to Aerospace Engineering

(AE)

Roll No										

Time: 2 hours 30 min **Max. Marks: 70**

Answer Any **Five** Questions

All Questions carries equal marks.

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1	What was the critical aerodynamic contribution that the Wright brothers implement in order to achieve the first heavier-than-air flight?	**[14M]**
2	What is (aerospace) engineering? What do (aerospace) engineers do? Where do (aerospace) engineers work?	**[14M]**
3	How is drag generated? Explain the different sources of drag.	**[14M]**
4	Consider an airplane patterned after the twin-engine Beechcraft Queen Air executive transport. The airplane weight is 38,220 N, wing area is 27.3 m^2, aspect ratio is 7 .5, Oswald efficiency factor is 0.9, and zero-lift drag coefficient is $C_{D,o}$ = 0.03. Calculate the thrust required to fly at a velocity of350 km/h at (a) standard sea level and (b) an altitude of 4.5 km.	**[14M]**
5	Discuss two environmental constraints that spacecraft designers consider during vehicle design and development. What current methods are used to overcome these	**[14M]**

environmental effects?

6 A reciprocating engine for light aircraft, modeled after the Avco Lycoming O-235 engine, has the following characteristics: bore= 11.1 cm, stroke= 9.84 cm, number of pistons= 4, compression ratio= 6.75, mechanical efficiency= 0.83. It is connected to a propeller with an efficiency of 0.85. If the fuel-to-air ratio is 0.06 and the pressure and temperature in the intake manifold are 1 atm and 285 K, respectively, calculate the power available from the engine-propeller combination at 2800 rpm. **[14M]**

7 You are a structural engineer for NASA. Point out two strengths and two weaknesses of the current Space Shuttle's structure. Based on your knowledge of engineering, suggest improvements and revisions. **[14M]**

8 Explain with neat sketch the principles of a Sub-sonic wind tunnel. **[14M]**

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Code No: **R17A0362** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, February 2021

Mechanics of Fluids

(AE)

Roll No										

Time: 2 hours 30 min **Max. Marks: 70**

Answer Any **Five** Questions

All Questions carries equal marks.

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1	a) Describe the working of U-tube differential manometer with a neat sketch.	**[7M]**
	b) Derive the Newton's law of viscosity.	**[7M]**
2	a) Determine the depth of a point below water surface in sea where the pressure intensity is 100.65kN/m^2.Specific gravity of sea water is 1.035.	**[7M]**
	b) Explain the working of differential manometer with a neat sketch and mention its applications in fluid dynamics.	**[7M]**
3	a) Distinguish between one dimensional and three dimensional flow with suitable examples.	**[7M]**
	b) Find whether the continuity equation is satisfied by the following velocity components for an incompressible fluid $u=x^2y$, $v=2xy-xy^2$, $w=x^2-z^2$.	**[7M]**
4	a)The velocity components in x and y directions are given as $u=2xy^3/3-x^2y$ and $v=xy^2-2yx^3/3$. Indicate whether the given velocity distribution is i) A possible field of flow ii) Not a possible field of flow.	**[7M]**
	b) Derive Euler's equation of motion.	**[7M]**

5 a) Derive Darcy weisbech equation in a flow through pipes. **[7M]**

b) Describe the working of venturimeter with a neat sketch **[7M]**

6 a) A pipe A 450mm in diameter, conveying water branches into two pipes (B and C of diameters 350mm and 250mm respectively).i) Find the discharge in pipe (A) if the average velocity of water in this pipe is 3.5m/sec. ii) Determine the velocity of water in 250mm pipe if the average velocity in 350mm diameter pipe is 2.5m/sec. **[7M]**

b) Explain the working of venturimeter with an example. **[7M]**

7 a) Explain the boundary layer procedure. **[7M]**

b) Air flows parallel to a speed limit sign along the highway at speed V = 5m/s. The temperature of the air is 25^{o} C, and the width W of the sign parallel to the flow direction is 0.45 m. Is the boundary layer on the sign laminar or turbulent or transitional? **[7M]**

8 a) What are the reasons for nondimensionalizing an equation? **[7M]**

b) List and describe the three necessary conditions for complete similarity between a model and a prototype. **[7M]**

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Code No: **R17A0363** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, February 2021

Mechanics of Solids

(AE)

Roll No										

Time: 2 hours 30 min **Max. Marks: 70**

Answer Any **Five** Questions

All Questions carries equal marks.

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1	a)	Define the terms: Elasticity, elastic limit, Young's Modulus and Modulus of Rigidity.	**[7M]**
	b)	A rod 200 cm long and of diameter 3 cm is subjected to an axial pull of 30 kN. If the Young's Modulus of the material of the rod is 2 x 10^5 N/mm^2, determine i) stress ii) strain and iii) the elongation of the rod.	**[7M]**
2	a)	What is bulk modulus? Derive an expression for Young's Modulus in terms of bulk modulus and Poisson's ratio.	**[7M]**
	b)	Prove that the maximum stress induced in a body due to suddenly applied load is twice the stress induced when the same load is applied gradually.	**[7M]**
3		A simply supported beam of 8 m length carries point loads of 4 kN and 6 kN at a distance of 2 m and 4 m from the left end. Draw the shear force and bending moment diagrams for the beam.	**[14M]**
4		A cantilever of length 2 m carries a uniformly distributed load of 2 kN/m length over the whole length and a point load of 3 kN at the free end. Draw the shear force and bending moment diagrams for the cantilever.	**[14M]**
5	a)	A rectangular beam 300 mm deep is simply supported over a span of 4 m. Determine the uniformly distributed load per metre which the beam may carry, if the bending stress should not to exceed 120 N/mm^2. Take I = 8 x 10 ^{6} mm^4.	**[10M]**
	b)	Define the terms: neutral axis, section modulus.	**[4M]**
6		An I – section with rectangular ends has the following dimensions: Flanges: 10 cm x 1cm; web: 12 cm x 1 cm. If this section is subjected to a bending moment of 5 kN-m	**[14M]**

and a shearing force of 5 kN, find the maximum tensile and shear stresses induced in it.

7 At a certain point in a strained material, the intensities of stresses on two planes at right angles to each other are 20 N/mm^2 and 10 N/mm^2 both tensile. They are accompanied by a shear stress of magnitude 10 N/mm^2. Find graphically the location of principal planes and evaluate principal stresses. **[14M]**

8 A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 rpm. Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60 N/mm^2. **[14M]**

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Code No: **R17A0364** **R17**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, February 2021

Thermodynamics

(AE)

Roll No										

Time: 2 hours 30 min **Max. Marks: 70**

Answer Any **Five** Questions

All Questions carries equal marks.

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1 a) Differentiate between intensive and extensive properties. Give examples in each case. **[7M]**

b) Discuss the macroscopic and micro scopic point of view of thermodynamics. **[7M]**

2 In a steady flow apparatus, 135 kJ *of* work is done by each kg of fluid. The specific volume *of* the fluid, pressure, and velocity at the inlet are 0.37 m^3/kg, 600kPa, and 16m/s. The inlet is 32 m above the floor, and the discharge pipe is at floor level. The discharge conditions are 0.62m^3/ kg, 100kPa, and 270m/s. The total heat loss between the inlet and discharge is 9kJ/kg *of* fluid. In flowing through this apparatus, does the specific internal energy increase *or* decrease, and by how much? **[14M]**

3 Which is the more effective way to increase the efficiency of a Carnot engine: to increase T_1, keeping T_2 constant; or to decrease T_2, keeping T_1 constant? **[14M]**

4 A reversible heat engine operates between two reservoirs at temperatures of 600° C and 40° C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 40° C and -20° C. The heat transfer to the heat engine is 2000 kJ and the net work output of the combined engine refrigerator plant is 360 kJ.

a) Evaluate the heat transfer to the refrigerant and the net heat transfer to the reservoir at 40^0C.

b) Reconsider (a) given that the efficiency of the heat engine and the COP of the refrigerator are each 40% of their maximum possible values. **[7M]**

[7M]

5 A steam boiler initially contains 5 m^3 *of* steam and 5 m^3 *of* water at 1 MPa. State2 taken *out* at constant pressure until 4m^3 *of* water is left. What is the heat transfer during the process? **[14M]**

6 A two-stage air compressor with perfect intercooling takes in air at 1 bar pressure and 27°C. The law of compression in both the stages is $Pv^{1.3}$= constant. The compressed air is delivered at 9 bar from the H.P. cylinder to an air receiver. Calculate, per kilogram of air, (a) the minimum work done and (b) the heat rejected to the intercooler. **[14M]**

7 Explain the terms i) dew point temperature ii) wet bulb temperature iii) degree of saturation. **[14M]**

8 An engine working on the Otto cycle has an air standard cycle efficiency of 56% and rejects 544 kJ/kg of air. The pressure and temperature of air at the beginning of compression are 0.1 Mpa and 60° C respectively. Compute (a) the compression ratio of the engine, (b) the work done per kg of air, (c) the pressure and temperature at the end of compression, and (d) the maximum pressure in the cycle **[14M]**

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