

(TE)

Roll No									
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Time: 3 hours

Max. Marks: 60

Note: This question paper contains two parts A and B

Part A is compulsory which carries 10 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 MARKS)**(Write all answers of this part at one place)**

- 1
- A when the stream, path and streak lines coincide? [1M]
- B Define the term circulation and vorticity. [1M]
- C Write down the expanded form of Navier-Stokes equation in cartesian coordinates. [1M]
- D Write the expression for pressure drop due to friction in Hagen-Poiseuille flow. [1M]
- E What is basic difference between approximate and similarity solution for boundary layer flow of an incompressible fluid over a flat plate? [1M]
- F Write the continuity boundary layer equation for a flat plate at angle of attack of zero incidence in 2-dimensional steady and compressible flow. [1M]
- G How does the pressure gradient influence boundary layer separation? [1M]
- H What are the limitations of k-epsilon model? [1M]
- I What is the significance of Mach number in compressible fluid flows? [1M]
- J Define the strength of shock wave. [1M]

PART-B (50 MARKS)**SECTION-I**

- 2
- A A two-dimensional flow is given by $u = y/b^2$ and $v = -x/a^2$. Determine the equation of the stream line passing through the point (a, 0). [5M]
- B Calculate the velocity components u and v for the following velocity potential functions ϕ : [5M]
- (a) $\phi = x^2 + y^2$; (b) $\phi = \sin x \sin y$ and (c) $\phi = \log (x + y)$.

OR

- 3
- A What is the irrotational velocity field associated with the potential $\phi = 3x^2 - 3x + 3y^2 + 16t^2 + 12zt$. Does the flow field satisfy the incompressible continuity equation. [5M]
- B Derive Bernoulli's equation from Euler's equations of motion. Also, list out the assumptions made and limitations of Bernoulli's equations. [5M]

SECTION-II

- 4
- A Derive the Navier Stokes equation for compressible flow. [5M]
- B A horizontal pipe 50 mm diameter carrying glycerine has shear stress at the pipe boundary as 196.2 N/m^2 . Determine the pressure gradient, mean velocity and Reynolds number. Take for glycerine density as 1275.3 kg/m^3 dynamic viscosity 0.8 Pa-s . [5M]

OR

- 5 A Derive an expression for velocity distribution in Couette flow between two parallel flat plates. [5M]
B Two parallel plates are placed horizontally 10 mm apart. The bottom plate is fixed and the top plate is moved at a uniform speed of 0.25 m/s. The fluid between them has a dynamic viscosity equal to 1.472 Pa-s. Determine the pressure gradient corresponds to the condition of zero discharge between the plates and the shearing stress at each plate. [5M]

SECTION-III

- 6 A Determine the displacement thickness and momentum thickness for the velocity profile $u/u_\infty = 2(y/\delta) - (y/\delta)^2$, where 'u' is the velocity of flow at a height 'y' above the surface, δ is boundary layer thickness and 'u_∞' is the free-stream velocity. [5M]
B Water of kinematic viscosity 10^{-6} m²/s is following steadily over a smooth flat plate at zero angle of attack with a velocity of 2 m/s. The length of the plate is 1.6 m. Calculate (i) the thickness of the boundary layer of 20 cm from the leading edge (ii) the boundary layer rate of growth at 20 cm from the leading edge. [5M]

OR

- 7 A Derive the expressions for local and mean drag coefficients for cubic velocity profile. [5M]
B A smooth flat plate 2.0m wide and 2.5m long is towed in oil of relative density 0.8 at a velocity of 1.5m/s along its length. Find the shear stress at the centre and the trailing edge of the plate. Also find the power required for the towing the plate. Take the kinematic viscosity of oil as 10^{-4} m²/s. [5M]

SECTION-IV

- 8 A Discuss the different methods for boundary layer control in flow over surfaces with the aid of neat sketches. [5M]
B A torpedo which has a width of 3 m and length 2 m is launched in sea water at a speed of 7 m/sec. Assuming the boundary layer to be fully turbulent, determine the drag and the boundary layer thickness at the trailing edge. Assume density and viscosity of sea water as 1030 kg/m³ and 1.6 centi-poise. [5M]

OR

- 9 A Discuss the significance of Moody's diagram with a suitable example. [5M]
B In a hydro dynamically rough pipe of diameter 30 cm having turbulent flow, the center line velocity is 5 m/s and the local velocity at 15 cm from the pipe center is 2.5 m/s. Find the discharge and the height of the roughness projection. [5M]

SECTION-V

- 10 A Discuss about normal compressible shock and oblique shock. [5M]
B An aeroplane is flying at 1000 km/h through still air having an absolute pressure of 100 kN/m² and temperature -6°C. Calculate, (i) Stagnation pressure, (ii) Stagnation temperature and (iii) Stagnation density. [5M]

OR

- 11 A normal shock wave occurs in air flowing at a Mach number of 1.5. The static pressure and temperature of the air upstream of a shock wave are 1 bar and 300 K. Determine the Mach number, pressure and temperature downstream of the wave. Also estimate the shock strength. [10M]

Code No: R22D2104

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

Solar Energy Technology

(TE)

Roll No										
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Time: 3 hours

Max. Marks: 60

Note: This question paper contains two parts A and B

Part A is compulsory which carries 10 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A List out any two non conventional energy sources [1M]
- B Define solar constant [1M]
- C What are uses of heliostats [1M]
- D What are the different power generating cycles [1M]
- E Give applications of solar stills [1M]
- F Differentiate active and passive heating systems [1M]
- G What is direct energy conversion [1M]
- H List out different solar cells [1M]
- I What are the different photocells [1M]
- J Give two applications for Photo voltaic cells [1M]

PART-B (50 MARKS)

SECTION-I

- 2 A Explain flat plate collector with its merits and demerits [5M]
- B Explain central tower receiver with its merits and demerits [5M]
- OR
- 3 A Describe the applications of solar energy [5M]
- B Describe Pyrheliometer, Pyranometer with neat sketches [5M]

SECTION-II

- 4 Describe solar central receiver system [10M]
- OR

- 5 Explain solar distributed receiver system [10M]

SECTION-III

- 6 Describe sensible heat storage methods [10M]
- OR

- 7 Explain about working air pre heaters [10M]

SECTION-IV

- 8 Explain different types of solar cells with sketches [10M]
- OR

9 What are the different solar cells, Write Importance and applications of fuels cells [10M]

SECTION-V

10 Explain life cycle costs in solar energy systems [10M]

OR

11 Explain optimization in solar energy systems [10M]

Code No: R22D2106

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

Advanced I.C. Engines

(TE)

Roll No									
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Time: 3 hours

Max. Marks: 60

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Part A is compulsory which carries 10 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A What are the engine design parameters? [1M]
- B What are the different types of computer models? [1M]
- C Define Gas Exchange Process? [1M]
- D Define squish in IC engine? [1M]
- E What are the phases of CI engine combustion? [1M]
- F What type of combustion occurs in CI engine? [1M]
- G How does CO affect the environment? [1M]
- H What is the catalytic treatment of exhaust gas? [1M]
- I Why is heat transfer important in engines? [1M]
- J What are the main advantages of HCCI engine over SI and CI engine? [1M]

PART-B (50 MARKS)

SECTION-I

- 2 A Explain the effect of change of number of molecules during combustion on maximum pressure in the Otto cycle [5M]
- B How do the specific heats vary with temperature? what is the physical explanation for this variation [5M]

OR

- 3 Explain by means of suitable graphs the effect of dissociation on maximum temperature and brake power. How does the presence of CO affect dissociation? [10M]

SECTION-II

- 4 A Define swirl?. Explain the role of swirl in complete combustion [5M]
- B Describe the flow patterns required for downstream of inlet port of a diesel engine. [5M]

OR

- 5 Explain with a neat sketch the principle of exhaust turbocharging of a single-cylinder engine [10M]

SECTION-III

- 6 A Explain the factors for abnormal combustion in S.I. Engine [5M]
- B Explain the working of MPFI with neat sketch [5M]

OR

7 What is the delay period, and what are the factors that affect it in the CI engine [10M]

SECTION-IV

8 A How NO and NO_x are measured? Explain any one analyzer with a neat sketch. [5M]

B Name different types of catalytic converters and explain the working of any one catalytic converter. [5M]

OR

9 A What is Exhaust Gas Treatment? Explain how it reduces the NO_x emission [5M]

B What are the causes and problems of exhaust emissions? [5M]

SECTION-V

10 A what are the design and operating variables that may decrease the formation of HC in the exhaust of an SI engine? Briefly explain them. [5M]

B Explain the methods to adopt for maximum heat utilization in an IC engine [5M]

OR

11 A Why should one go for lean burn operations? Explain the basics of lean burn technology [5M]

B Explain the concept of HCCI. Describe the various control mechanisms for HCCI [5M]

Code No: R22D2101

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

Advanced Thermodynamics

(TE)

Roll No										
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Time: 3 hours

Max. Marks: 60

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Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1
- A What is a cyclic heat engine? [1M]
 - B Give the Clausius statement of the second law' [1M]
 - C Define an ideal gas. [1M]
 - D What is the condition for exact differential? [1M]
 - E What is a chemical fuel? [1M]
 - F Write a short note on excess air. [1M]
 - G State the advantage of simple Rankine cycle. [1M]
 - H Draw a neat sketch of Binary vapour cycle. [1M]
 - I Name the different type of primary energy sources. [1M]
 - J What is fuel cell. [1M]

PART-B (50 MARKS)

SECTION-I

- 2
- A What is the qualitative difference between heat and work? Why are heat and work not completely interchangeable forms of energy? [5M]
 - B A cyclic heat engine operates between a source temperature of 800°C and a sink temperature of 30°C . What is the least rate of heat rejection per kW net output of the engine? [5M]

OR

- 3
- A Give the criteria of reversibility and irreversibility of a thermodynamic cycle. [5M]
 - B Derive the Maxwell relations and explain their importance in thermodynamics. [5M]

SECTION-II

- 4
- A Write and discuss Vander Waals equation. [5M]
 - B The volume of a high altitude chamber is 40 m^3 . It is put into operation by reducing pressure from 1 bar to 0.4 bar and temperature from 25°C to 5°C . How many kg of air must be removed from the chamber during process? Express this mass as a volume measured at 1 bar and 25°C . Take $R = 287\text{ J/kg K}$ for air. [5M]

OR

- 5 A Describe briefly (i) Cooling and dehumidification and (ii) Heating and humidification. [5M]
B The air supplied to a room of building in winter is to be at temperature 17°C and have a relative humidity of 60%. If the barometric pressure is 1.01325 bars, find (i) The specific humidity and (ii) The dew point under these conditions. [5M]

SECTION-III

- 6 A Discuss the importance of chemical thermodynamics. [5M]
B Enumerate the methods by which air-fuel ratio can be calculated when analysis of combustion products is known. [5M]

OR

- 7 A Explain in detail Gibbs phase rule. [5M]
B Derive relations for internal energy and enthalpy of reaction. [5M]

SECTION-IV

- 8 A Describe binary vapour cycle with a neat sketch. [5M]
B With a neat sketch explain topping and bottoming cycles. [5M]

OR

- 9 A State and explain the merits and demerits of an air refrigeration system. [5M]
B Explain the simple vapour compression refrigeration cycle giving clearly its flow diagram. [5M]

SECTION-V

- 10 A Discuss the working principle a fuel cell with reference to $\text{H}_2\text{-O}_2$ cell. [5M]
B What is the principle of thermo- electric energy conversion? Explain. [5M]

OR

- 11 A Explain the principle of solar photovoltaic power generation? [5M]
B Describe a Magneto hydrodynamic open cycle system. [5M]

Code No: R22DHS53

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R22

(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Regular/Supplementary Examinations, March 2024

Research Methodology

(MD, TE, CSE, VLSIES & ASP)

Roll No									
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Time: 3 hours

Max. Marks: 60

Note: This question paper contains two parts A and B

Part A is compulsory which carries 10 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (10 MARKS)

(Write all answers of this part at one place)

- 1 A What is a Motivation in research? [1M]
- B What do you mean by Design of the research project. [1M]
- C What is a Pilot survey? [1M]
- D List the Components of a research problem. [1M]
- E What do you mean by Thematic Apperception Test [1M]
- F What are the ethical issue in collecting data? [1M]
- G Distinguish between Exclusive type and inclusive type class intervals [1M]
- H What do you mean by Sampling frame. [1M]
- I Distinguish between the Null hypothesis and alternative hypothesis [1M]
- J What is mean and variance? [1M]

PART-B (50 MARKS)

SECTION-I

- 2 A What do you mean by research? Explain its significance in modern times [5M]
 - B Distinguish between Research methods and Research methodology. [5M]
- OR
- 3 A Describe the different types of research, clearly pointing out the difference between an experiment and a survey [5M]
 - B Briefly describe the different steps involved in a research process [5M]

SECTION-II

- 4 A Describe fully the techniques of defining a research problem [5M]
 - B How do you define a research problem? Give three examples to illustrate your answer [5M]
- OR
- 5 A “Knowing what data are available often serves to narrow down the problem itself as well as the technique that might be used.” Explain the underlying idea in this statement in the context of defining a research problem [5M]
 - B Explain how to formulate the objectives of Research Work. [5M]

SECTION-III

- 6 A Describe some of the important research designs used in experimental hypothesis-testing research study. **[5M]**
 B “Research design in exploratory studies must be flexible but in descriptive studies, it must minimise bias and maximise reliability.”
 Discuss **[5M]**

OR

- 7 A Explain the meaning and significance of a Research design **[5M]**
 B Enumerate the different methods of collecting data. Which one is the most suitable for conducting enquiry regarding family welfare programme in India? Explain its merits and demerits. **[5M]**

SECTION-IV

- 8 A Write a brief note on different types of analysis of data pointing out the significance of each. **[5M]**
 B How will you differentiate between descriptive statistics and inferential statistics? **[5M]**

OR

- 9 A What does a measure of central tendency indicate? **[5M]**
 B Explain the meaning and significance of the concept of “Standard Error’ in sampling analysis. **[5M]**

SECTION-V

- 10 A The procedure of testing hypothesis requires a researcher to adopt several steps. Describe in brief all such steps. **[5M]**
 B Explain the meaning of analysis of variance. Briefly describe the technique of analysis of variance for one-way and two-way classifications. **[5M]**

OR

- 11 A Write short notes on the following Precautions in applying Chi-square test **[5M]**
 B State the basic assumptions of the analysis of variance. **[5M]**
