

Code No: R20D2104

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)

M.Tech I Year I Semester Supplementary Examinations, December 2021

Solar Energy Technology
(TE)

Roll No									
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing **ONE** Question from each **SECTION** and each Question carries 14 marks.

SECTION-I

1. **A** Explain in detail the different types of solar energy measuring instruments. [7M]
1. **B** Express extra-terrestrial and terrestrial solar radiation. [7M]

OR

2. **A** Explain Compound Parabolic Concentrators. [7M]
2. **B** Summarize the advantages and disadvantages of concentrating collectors over a flat plate collector? [7M]

SECTION-II

- 3 Explain solar different types of distributed receiver system with neat sketch [14M]

OR

4. **A** Write a detailed note of different working fluids used in solar heating [7M]
4. **B** Explain any one power cycle used in solar power generation [7M]

SECTION-III

5. **A** Discuss any one Method of active and passive heating systems [7M]
5. **B** With an example elaborate the working of solar air heaters [7M]

OR

6. **A** With the help of a neat sketch describe a solar heating system using water heating solar collectors. What are the advantages and disadvantages of this method? [7M]
6. **B** Discuss in detail the working of Solar Refrigeration with line diagram [7M]

SECTION-IV

7. **A** Discuss about photon energy in detail [7M]
7. **B** What is electron hole concentration and fermi level explain in detail [7M]

OR

8. **A** Discuss the effect of shunt resistance for a typical silicon solar cell [7M]
8. **B** Explain the effect of temperature on the maximum voltage from a semiconductor [7M]

SECTION-V

9. **A** Explain the concept of investment in solar Energy Technology. [7M]
9. **B** Discuss about cost benefit analysis [7M]

OR

- 10 Discuss in detail cost benefit comparison method and payback period method [14M]

Research Methodology
(TE, VLSI&ES & ASP)

Roll No									
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 Define research, motives for business research, and distinguish between fundamental research and applied research and examine the series of interrelated steps in management research process. [14M]

OR

- 2 What do you understand by research methodology, state the types of research, and apprehend the steps that need to be accomplished in order to complete the management research study? [14M]

SECTION-II

- 3 How do you formulate a research problem? What considerations should a researcher keep in mind while formulating a research question and discuss the importance of literature review in approaching a research problem? [14M]

OR

- 4 Discuss the purpose of hypothesis in marketing research, highlight the procedure of developing a good hypothesis and how is a null hypothesis tested? [14M]

SECTION-III

- 5 What is the purpose of research design? Explain the elements, principals of experimental research design? and brief on types of research design suitable of researching the online education system in India. [14M]

OR

- 6 Discuss different methods of collecting data, its merits and demerits and brief on the ethical issues in collecting data. [14M]

SECTION-IV

- 7 What is the significance of sample selection, explain the factors should be considered while sample selection and brief on various sampling methods? [14M]

OR

- 8 Discuss the role of measures of central tendency in data analysis and what test is used to examine the statistical significance of correlation coefficient? [14M]

SECTION-V

- 9 Examine the role of analysis of variance in research? Discuss the procedure involved in analysis of variance; tabulate the ANOVA table in both the one-way and the two-way classification. [14M]

OR

- 10 Examine the basic principles and techniques of writing the research proposal and brief on the various stages, criteria for good research report. [14M]

Code No: R20D2102

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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R20

M.Tech I Year I Semester Supplementary Examinations, December 2021
Advanced Fluid Mechanics

(TE)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 A. Define the following terms” [7M]
i. Stream lines
ii. Streak lines
iii. velocity potential [7M]
B. Derive an expression for Momentum equation
OR
- 2 In the two-dimensional incompressible flow field, the velocity components are [14M]
expressed as $U = 2x - x^2 y + y^3 / 3$ and $v = -2y + xy^2 - x^3 / 3$
(i) Determine the velocity and acceleration at point P (x=1m, y=3m).
(ii) Is the flow physically possible? If so, obtain an expression for the stream function.
(iii) What is the discharge between the streamlines passing through (1, 3) and (2, 3)?
(iv) Is the flow irrotational? If so, determine the corresponding velocity potential.
(v) Show that each of the stream and potential functions satisfy the Laplace equation.

SECTION-II

- 3 a) Obtain an expression for velocity and discharge of a flow-through a pipeline of diameter 'D', using Hagen-Poiseuille's equation. [7M]
b) Arrive at relation for the non-dimensional pressure gradient in Couette flow. [7M]
OR
- 4 a) Write a short note on Plain Poiseuille flow [7M]
b) Derive an expression for the velocity distribution for viscous flow through a circular pipe. Also, sketch the distribution of velocity and shear stress across a section of the pipe. [7M]

SECTION-III

- 5 How is the thickness of the boundary layer, shear stress, and the drag force along the flat plate determined by Von Karman momentum equation? [14M]

OR

- 6 Water flows over a thin, smooth plate of length 5m and width 2.7m at a velocity of 1.2 m/sec. If the boundary layer flow changes from laminar to turbulent at a Reynolds number 5×10^5 . Find:
- i) The distance from the leading edge up to which boundary layer is laminar and [7M]
- ii) Thickness of the boundary layer at the transition point. [7M]

SECTION-IV

- 7 a) What do you understand by the hydraulically smooth and rough pipes? [7M]
- b) For turbulent flow in a pipe of 25 cm diameter, the centerline velocity is 2.25 m/s and the velocity at a point 8 cm from the center as measured by a pitot tube is 1.95 m/s. Make calculations for (i) friction velocity and wall shearing stress, (ii) average velocity and discharge through the pipe, (iii) friction factor, and (iv) pipe roughness. [7M]

OR

- 8 a) List various turbulence flow calculation models and illustrate one model with an example. [7M]
- b) What is meant by a fully developed flow? Plot the variation in velocity and pressure in a fully developed turbulent pipe flow. [7M]

SECTION-V

- 9 a) Explain two situations where a normal shock wave is formed. [7M]
- b) Show using diagrams the nature of propagation of disturbance in compressible flow when Mach number is less than one, is equal to one, and is more than one. [7M]

OR

- 10 Explain the following: [5M]
- (a) Generalized Oblique Shock [5M]
- (b) Supersonic Wave Drag [4M]
- (c) Variation of velocity with an area ratio

Code No: R20D2106

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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R20

M.Tech I Year I Semester Supplementary Examinations, December 2021

Advanced I.C. Engines

(TE)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 What are different air fuel mixture as which gasoline engine operated? [14M]
Explain them?

OR

- 2 Discuss the effect of following engine variables on flame propagation. A) [14M]
Fuel air ratio b)compression ratio c) Engine load d) Turbulence e) Engine speed

SECTION-II

- 3 What are the main factors affecting the penetration of the fuel spray in CI engines? [14M]

OR

- 4 Define swirl. How is it generated and measured in the SI engine [14M]

SECTION-III

- 5 Using pressure crank angle diagram (P- θ) explains the different stages of normal [14M]
combustion in a SI engine. Also explain how abnormal combustion takes place
using the same P- θ diagram

OR

- 6 With a neat sketch explain briefly multi-point port fuel injection system. [14M]

SECTION-IV

- 7 Explain the techniques used in the selective catalytic reduction in controlling the [14M]
emission.

OR

8. A What are the effects of unburnt hydrocarbons on environment and human health? [7M]

8. B Discuss in detail about particulate emissions. [7M]

SECTION-V

- 9 Explain the working of Wankle engine [14M]

OR

- 10 Discuss in detail about the HCCI engine and its performance [14M]

Code No: R20D2101

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
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R20

M.Tech I Year I Semester Supplementary Examinations, December 2021
Advanced Thermodynamics

(TE)

Roll No										
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Time: 3 hours

Max. Marks: 70

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

SECTION-I

- 1 a) Derive the first and second Tds equations. Also derive the expression for difference in specific heat capacities C_p and C_v . What does the expression signify? [7M]
- b) Two identical steel blocks each of mass 1000 kg are available at two different temperatures. The first block is at 1200 K while the second block is at 600 K. The ambient temperature is 300 K. The specific heat of steel is 0.5 kJ/kg K. The blocks can be used as a source of energy to obtain work, till they are cooled to 300 K. Calculate the available anergy of each block. [7M]
- OR
- 2 a) What is meant by second law efficiency and what is the necessary of introducing the term second law efficiency? [7M]
- b) Consider a system A of mass 2 kg at 8 bar at 500 K and a system B of mass 1 kg at 10 bar at 300 K. Assume gas in systems A and B to be air. [7M]
- a. The two systems are adiabatic and divided by an insulated partition and by a pin. The pin is released. What is the final pressure? What are T_A and T_B ? Assume that the process is quasisteady. Assume an adiabatic expansion process for one cylinder.
- b. The two systems are divided by a diathermal wall. Except at the partition, there is no heat transfer. What is the final pressure? What are the final temperatures?

SECTION-II

- 3 a) Derive the Clausius- Clapeyron equation for phase change [7M]
- b) Write short notes on Psychrometric chart. [7M]
- OR
- 4 a) Atmospheric air at 1.0132 bar has a dbt of 32⁰C and wbt of 26⁰C. Compute i) partial pressure of water vapour, ii) specific humidity, iii) dew point temperature, iv) relative humidity, v) degree of saturation, vi) density of air in the mixture, vii) density of vapour in the mixture, viii) enthalpy of the mixture. [7M]
- b) State the principle of corresponding states and explain the use of generalized charts for enthalpy and entropy departure. [7M]

SECTION-III

- 5 a) Define chemical potential of a component in terms of U, H and G. [7M]
b) A gasoline engine delivers 150 KW. The fuel is C_8H_{18} and enters the engine at $25^\circ C$. 150% theoretical air is used, and it enters at $45^\circ C$. The products of combustion leave the engine at 750K, and the heat transfer from the engine is 205 kW. Determine the fuel consumption per hour if complete combustion is achieved. [7M]

OR

- 6 Determine the adiabatic flame temperature of the diesel fuel $C_{12}H_{26}$ with 100% excess air and with 100% theoretical air. [14M]

SECTION-IV

- 7 a) Obtain an expression for Onsager's reciprocity relations. [7M]
b) Explain the working of simple vapour compression refrigeration cycle and derive the expression for its COP. [7M]

OR

- 8 a) Discuss heat flux and entropy production. [7M]
b) Pure oxygen is heated from 298 K to 3200 K in a steady state process at a constant pressure of 200 kPa. Find the exit composition and the heat transfer. [7M]

SECTION-V

- 9 a) What is thermionic emission effect? How is space charge effect minimized? [7M]
Explain briefly about active element used in photovoltaics? [7M]

OR

- 10 What is the probability of occupancy for a state whose energy is (i) 0.1 eV above the energy, (ii) 0.1 eV below the Fermi energy and (iii) equal to the Fermi energy? Assume a temperature of 800 K. [14M]
