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| Regulation…R-18 …. Subject code: TKR COLLEGE OF ENGINEERING AND TECHNOLOGY  (Autonomous, Accredited by NAAC with ‘A’ Grade)  ***C:\Users\india\Desktop\tkrcet-logo.jpg*** **B.Tech 2nd Year1 Semester Regular/Supply Examinations, 2021**  **THERMODYNAMICS**  **(Mechanical Engineering)**  ***Maximum Marks: 70*** **Duration: 2 Hours**  **Note:** **1.This question paper contains two parts A and B.**  **2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.**  **3. Part B consists of 10 questions. Answer any 5 questions which carries 12M.**  **4. Each question carries 12marks and may have a, b, c, d as sub questions.** | | |
| Part-A Set- 1 | | | |
| **All the following questions carry equal marks (10x2M=20 Marks)** | | | |
| 1 | | **Define extensive property**. | |
| 2 | | **Distinguish between different types of systems with examples** | |
| 3 | | **State Clausius Statement of Second law of thermodynamics?** | |
| 4 | | **Define partial pressure?** | |
| 5 | | **What is the available energy in a system?** | |
| 6 | | **What is Throttling process** | |
| 7 | | **State the expression forvander walls equation and determine the constants?** | |
| 8 | | **What is mean by triple point?** | |
| 9 | | **Define specific humidity?** | |
| 10 | | **What are the process of Ericsson cycle?** | |
| **Part-B** | | | |
| **Answer ANY FIVE QUESTIONS (10MX 5=50Marks)** | | | |
| 11 | **Sketch the constant volume gas thermometer and explain** | | |
| 12 | **Describe briefly thermodynamic systems** | | |
| 13 | **State and prove Clausius inequality.** | | |
| 14 | **Bring out the concept of entropy and importance of TS diagram?** | | |
| 15 | **Explain the phase transformation process with diagram?** | | |
| 16 | **Describe with neat sketch P-T Diagram or Triple point** | | |
| 17 | **Explain about the Gravimetric analysis** | | |
| 18 | **Explain the properties of mixture of Ideal gases i) Gas constant ii) Molecular weight** | | |
| 19 | **Derive an expression for the efficiency of sterling cycle** | | |
| 20 | **Derive an expression for the air standard efficiency of diesel cycle** | | |

**Set-2**

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| Regulation……. Subject code: TKR COLLEGE OF ENGINEERING AND TECHNOLOGY  (Autonomous, Accredited by NAAC with ‘A’ Grade)  ***C:\Users\india\Desktop\tkrcet-logo.jpg*** **B.Tech --------Year …….Semester Regular/Supply Examinations, 2020**  **SUBJECT NAME**  **(Mechanical Engineering)**  ***Maximum Marks: 70*** **Duration: 2 Hours**  **Note:** **1.This question paper contains two parts A and B.**  **2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.**  **3. Part B consists of 10 questions. Answer any 5 questions which carries 12M.**  **4. Each question carries 12marks and may have a, b, c, d as sub questions.** | | |
| Part-A | | | |
| **All the following questions carry equal marks (10x2M=20 Marks)** | | | |
| 1 | | **why does free expansion have zero work transfer?** | |
| 2 | | **State the thermodynamic definition of work.** | |
| 3 | | **Define heat engine?** | |
| 4 | | **Mention the various process of Lenoir cycle?** | |
| 5 | | **What is meant by saturated steam?** | |
| 6 | | **Define Latent heat** | |
| 7 | | **State the boys law** | |
| 8 | | **Define Mole fraction** | |
| 9 | | **What is swept volume?** | |
| 10 | | **What unit of refrigeration?** | |
| **Part-B** | | | |
| **Answer ANY FIVE QUESTIONS (10MX 5=50Marks)** | | | |
| 11 | **A stationary mass of gas is compressed without friction from an initial state of 0.3 m3 and 0.105 MPA to a final stateOf 0.15 m3 and 0.105 mpa, the pressure remaining constant during the process.There is a transfer of 37.6kj of heat fromOf heat from the gas during the process.How much does the internal energy of the gas change?** | | |
| 12 | **Differentiate between microscopic approach and macroscopic approach** | | |
| 13 | Describe with neat sketch P-T Diagram or Triple point | | |
| 14 | **Define the term irreversibility process and Reversible process give an example of each?** | | |
| 15 | **Explain Throttling process with neat sketch** | | |
| 16 | Describe with neat sketch the Phase transformation process | | |
| 17 | A Vessel of 0.35 m3 capacity contains 0.4 kg of Carbon monoxide (molecular weight = 28) and 1 kg of air at 200C. Calculate i) The partial pressure of each constituent ii) The total pressure in the vessel. The gravimetric analysis of air may be taken as 23.3% Oxygen (molecular weight = 32) and 76.7% nitrogen (molecular weight = 28) | | |
| 18 | Explain about the Gravimetric analysis | | |
| 19 | ) Make comparison of Otto, Diesel, and Dual combustion cycles with respect to  i) Efficiency vs Compression Ratio  ii) For the same compression ratio and the same heat input | | |
| 20 | Derive an expression for the efficiency of Ericsson cycle | | |
| Part-A Set- 3 | | | | |
| **All the following questions carry equal marks (10x1M=10 Marks)** | | | | |
| 1 | | **Define thermodynamics** | | |
| 2 | | **Mention different thermodynamic systems** | | |
| 3 | | **Define first law of thermodynamics** | | |
| 4 | | **Define the Kelvin Planck statement of Second law of thermodynamics** | | |
| 5 | | **What is compressibility factor** | | |
| 6 | | **What is meant by Mass fraction** | | |
| 7 | | **Define an ideal gas** | | |
| 8 | | **What is meant by the enthalpy of a mixture of ideal gases** | | |
| 9 | | **Define a Cycle** | | |
| 10 | | **For a given compression ratio which is more efficient either Otto cycle or Diesel cycle** | | |
| Part-B | | | | |
| Answer **ANY FIVE QUESTIONS** **(12MX 5=60Marks)** | | | | |
| 11 | Explain the Quasi-Static process with a neat sketch | | | |
| 12 | Derive an expression for Steady flow energy equation and what are the assumptions made | | | |
| 13 | Explain with the help of a neat sketch the process of Free Expansion | | | |
| 14 | When a stationary mass of gas was compressed without friction at constant pressure, its initial state of 0.4 m3 and 0.105 Mpa was found to change to find state of 0.20 m3 and 0.105 Mpa. There was a transfer of 42.5 KJ of heat from the gas during the process. How much did the internal energy of the gas change. | | | |
| 15 | With help of a P-T diagram explain Clausius- Clapeyron equation | | | |
| 16 | Describe with neat sketch P-V-T surfaces | | | |
| 17 | Explain the Compressibility chart | | | |
| 18 | Explain the Avogadro’s law | | | |
| 19 | Derive an expression for the air-standard efficiency of Diesel cycle | | | |
| 20 | The stroke and cylinder diameter of a compression ignition engine are 250 mm and 150 mm respectively. If the clearance volume is 0.0004 m3 and fuel injection takes place at constant pressure for 5% of the stroke, determine the efficiency of the engine. Assume the engine working on the diesel cycle | | | |

**SET-4**

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| Part-A | | |
| **All the following questions carry equal marks (10x1M=10 Marks)** | | |
| 1 | | Define a Control volume |
| 2 | | What is meant by thermodynamic equilibrium |
| 3 | | What is Perpetual Motion Machine of first kind – PMM-1 |
| 4 | | Define enthalpy |
| 5 | | In general, what are the three phases of a pure substance |
| 6 | | Define Triple Point |
| 7 | | What is compressibility factor |
| 8 | | Define Partial pressure |
| 9 | | Write the relation between specific heats and adiabatic index? |
| 10 | | What is mean by mean effective pressure |
| Part-B **(12MX 5=60Marks)** | | |
| 11 | Air contained in the cylinder and piston arrangement comprises the system. A cycle is completed by four process 1-2, 2-3, 3-4 and 4-1.  The energy transfers are listed below.  Complete the table and determine the network in kJ. Also check the validity of the first law of thermodynamics.in Process Q (kJ) W (kJ) ΔU (kJ)  1-2 40 ? 25  2-3 20 -10 ?  3-4 -20 ? ?  4-1 0 +8 ? | |
| 12 | Explain with a neat sketch Pdv work or Displacement work | |
| 13 | Explain with a neat sketch the Joule’s Experiment | |
| 14 | In a gas turbine unit, the gases flow through the turbine is 15 kg /sec and the power developed by the turbine is 12000KW. The enthalpies of gases at the inlet and outlet are 1260 KJ/kg and 400 KJ/kg respectively, and the velocity of gases at the inlet and outlet are 50 m/s and 110 m/s respectively. | |
| 15 | Calculate the state of steam i.e. Whether it is wet, dry or superheated for following cases  (i) Steam has a pressure of 15 bar and specific volume of 0.12 m3/kg  (ii) Steam has a pressure of 10 bar and temperature 2000C  (iii) Steam has a pressure of 30 bar and if 2700 KJ/kg of heat is required to generate steam | |
| 16 | Explain the properties of mixture of Ideal gases i) Gas constant ii) Molecular weight | |
| 17 | Explain the Volumetric analysis of a gas mixture | |
| 18 | The volume analysis of gas and other data are as follows:  Constituent Percentage Molecular Weight  Oxygen 23.14 32  Nitrogen 75.53 28  Argon 1.28 40  Carbon dioxide 0.05 44  Calculate i) Gas constant for air and ii) Apparent molecular weight | |
| 19 | Compare the dual ,diesel and otto cycles? | |
| 20 | The swept volume of a diesel engine working on dual cycle is 0.0053 m3 and clearance volume is 0.00035 m3. The maximum pressure is 65 bar. Fuel injection ends at 5% of the stroke. The temperature and pressure at the start of the compression are 800C and 0.9 bar. Determine the air standard efficiency of the cycle. Take for air as 1.4 | |