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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
 (AUTONOMOUS)  
**B TECH III YEAR I SEMESTER SUPPLEMENTARY EXAMINATIONS July-2022**  
**THERMAL ENGINEERING**  
 (Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Explain any six classifications of Internal Combustion engines. **L1 6M**  
 b With a neat sketch explain any three parts in Internal Combustion engine. **L2 6M**

**OR**

- 2 a A gasoline engine works on Otto cycle. It consumes 8 litres of gasoline per hour and develops power at the rate of 25 kW. The specific gravity of gasoline is 0.8 and its calorific value is 44000kJ/kg. Find the indicated thermal efficiency of the engine. **L3 6M**  
 b A single cylinder engine operating at 2000 rpm develops a torque of 8 N-m. The indicated power of the engine is 2 kW. Find loss due to friction as the percentage of brake power. **L3 6M**

**UNIT-II**

- 3 a Derive an expression for minimum work required for two stage reciprocating air compressor with perfect inter-cooling and neglect clearance volume. **L1 6M**  
 b A single stage single acting air compressor has an effective swept volume of 5m<sup>3</sup>/min and delivers to a receiver pressure of 6.5 bar. The index of compression is 1.25. Calculate work done. **L3 6M**

**OR**

- 4 a With the help of neat sketch explain the working principle of single stage reciprocating air compressor. **L1 6M**  
 b With the help of neat sketch explain the working principle of multi stage reciprocating air compressor with effect of intercooler. **L2 6M**

**UNIT-III**

- 5 a Describe the different operations of Rankine cycle and also derive the expression for its efficiency. **L1 6M**  
 b A steam power plant works between 40 bar and 0.05 bar. If the steam supplied is dry saturated and the cycle of operation is Rankine, Find:  
 (i) Cycle efficiency, (ii) Specific steam consumption **L2 6M**

**OR**

- 6 A steam power plant operates on a theoretical reheat cycle. Steam at boiler at 550°C, 150 bar expands through the high pressure turbine. It is reheated at a constant pressure of 40 bar to 550°C and expands through the low pressure turbine to a condenser at 0.1 bar. Draw T-S and h-s diagrams. Find (i) Quality of steam at turbine exhaust (ii) Cycle Efficiency (iii) Steam rate in Kg/ Kw-hr. **L3 12M**

**UNIT-IV**

- 7 a Define Steam nozzle and also explain about expansion of steam in nozzle with neat sketch. **L1 6M**  
 b Explain various types of nozzles with neat sketches. **L1 6M**

**OR**

- 8 Explain about jet condenser and various types of jet condenser with neat sketches. **L2 12M**

**UNIT-V**

- 9 a Explain various efficiencies that are associated with turbines. **L1 6M**  
b The velocity of steam leaving the nozzle of a impulse turbine is 200m/s and nozzle angle is  $20^\circ$  blade velocity is 375m/s, blade velocity coefficient 0.75. Assume no loss at inlet. Calculate the following for mass flow of 0.5kg/s symmetrical blading. **L3 6M**  
i. blade inlet angle ii. driving force on wheel  
iii. axial thrust on wheel iv. power developed by turbine
- OR**
- 10 Draw the combined velocity triangle of Parson's reaction turbine and explain the silent features. **L2 12M**

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