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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B. Tech II Year I Semester Supplementary Examinations November-2022
THERMAL ENGINEERING

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 a Derive an expression for minimum work required for two stage reciprocating air compressor with perfect inter-cooling and neglect clearance volume. **L2 6M**
 b What are the various classifications of air compressors. **L2 6M**
- OR**
- 2 Air from an initial condition of 25°C and 1 bar abs is compressed in 2 stage according to law $PV^{1.25} = \text{constant}$ and with complete intercooling to a pressure of 36 bar abs. Estimate the minimum work required and heat rejected in the intercooler per kg of air. Assume $C_p = 1.05 \text{ kJ/kg}$ and $R = 0.29 \text{ kJ/kg K}$. **L3 12M**

UNIT-II

- 3 Brief the working of Brayton Cycle with the help of p-v diagram and T-s diagram. **L2 12M**
- OR**
- 4 In an oil gas turbine installation, air is taken at 1 bar and 300°C. The air is compressed to 4 bar and then heated by burning the oil to a temperature of 5000°C. If the air flows at the rate of 90 kg/Minute, find the power developed by the plant. Take γ for air as 1.4 and C_p as 1 kJ/kgK. **L3 12M**

UNIT-III

- 5 a Explain about super saturated flow in nozzles with neat sketch. And represent in H-S diagram. **L2 8M**
 b What are the effects of friction on flow through nozzle? **L2 4M**
- OR**
- 6 Dry saturated steam at a pressure of 11 bar is Expanded in a nozzle to 2 bar. If the flow is isentropic, determine, (i) the throat velocity (ii) exit velocity (iii) ratio of cross sectional area from exit to throat. **L3 12M**

UNIT-IV

- 7 a Draw and explain the velocity triangle of impulse turbine. **L2 6M**
 b Derive an expression for work done in impulse turbine. **L2 6M**
- OR**
- 8 Draw the combined velocity triangle of Parson's reaction turbine and explain the salient features. **L2 12M**

UNIT-V

- 9 A test on a single cylinder 4 stroke Otto cycle engine yields the following data: 950 Nm Torque, 7.6 bar mean effective pressure, 280 mm bore, 305 mm stroke, 3000 rpm, 0.003 kg/s fuel consumption with heating value of 42000 kJ/kg. Determine: (i) Indicated thermal Efficiency (ii) Mechanical efficiency. **L3 12M**

OR

- 10 Define Brake Power, Indicated Power. Explain various methods of Measuring them. **L2 12M**

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