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

**B.Tech III Year I Semester Regular & Supplementary Examinations Nov/Dec 2019**

**THERMAL ENGINEERING**  
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a Explain the working of 4-stroke Diesel engine. Draw theoretical and actual valve-timing diagram for diesel engine. 6M  
b Brief the Working Principle of 2-Stroke SI Engine. 6M

**OR**

- 2 a What are the important basic components of an internal combustion engines? Explain them briefly. 6M  
b A single cylinder engine operating at 2000 rpm develops a torque of 8 N-m. The indicated power of the engine is 2.0 kW. Find loss due to friction as the percentage of brake power. 6M

**UNIT-II**

- 3 a With the help of neat sketch explain the working principle of single stage reciprocating air compressor. 6M  
b A single stage reciprocating air compressor is required to compress 80 m<sup>3</sup> of air from 1 bar abs to 10 bar abs. Find the work to be supplied if the law of expansion is  $PV^{1.25} = \text{Constant}$ . 6M

**OR**

- 4 a What are the various classifications of air compressors? 6M  
b Air from an initial conditions 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  $R = 0.29 \text{ KJ/Kg K}$ . 6M

**UNIT-III**

- 5 a State the methods of increasing the thermal efficiency of Rankine cycle. 6M  
b In a regenerative cycle inlet conditions are 40 bar and 400°C. Steam is bled at 10 bar in regenerative heating. The exit pressure is 0.8 bar. Neglecting the pump work. Determine the efficiency of the cycle. 6M

**OR**

- 6 a State the advantages and disadvantages of a Reheat cycle 6M  
b Explain the followings i) dryness Fraction ii) saturated water iii) latent heat and iv) Sensible heat. 6M

**UNIT-IV**

- 7 a Explain various types of nozzles with neat sketches. 8M  
b Derive pressure ratio relation for various flows involves in nozzle 4M

**OR**

- 8 Dry saturated steam enters a frictionless adiabatic nozzle with negligible velocity at a temperature of 3000C. It is expanded to a pressure of 5000KPa. The mass flow rate is 1Kg/s. Calculate the exit velocity of steam. 12M

**UNIT-V**

- 9 Draw the combined velocity triangle of Impulse turbine and explain the salient features. **12M**

**OR**

- 10 In a De-Laval turbine, the steam enters the wheel through a nozzle with a velocity of 350m/s at an angle of  $20^\circ$  to direction of motion of the blade. The blade speed is 250m/s and exit angle of moving blade is  $35^\circ$ . Find the inlet angle of moving blade, exit velocity of steam & its direction and work done per kg of steam. **12M**

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