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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Regular Examinations November 2018

THERMAL ENGINEERING

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 **a** A 4-cylinder, 4-stroke cycle engine having cylinder diameter 100 mm and stroke 120 mm was tested at 1600 rpm and the following readings were obtained. Fuel consumption = 0.27 liters/minute, Specific gravity fuel = 0.74, B.P. = 31.4 kW Mechanical efficiency = 80%, Calorific value of fuel = 44000 kJ/kg. Determine : (i) BSFC, (ii) IMEP, and (iii) Brake thermal efficiency 7M

b Explain the Working Principles of 2-Stroke Diesel Engine 5M

OR

2 **a** A single cylinder and stroke cycle I.C. engine when tested, the following observations available :Area of indicator diagram = 3 sq.cm, Length of indicator diagram = 4 cm, Spring constant = 10 bar/cm, Speed of engine = 400 rpm, Brake drum diameter = 120 cm, Dead weight on brake = 380 N, Spring balance reading = 50 N, Fuel consumption = 2.8 kg/hr., C.V= 42000 kJ/kg, Cylinder diameter =16 cm, Piston stroke = 20 cm. Find :(i) F.P., (ii) Mechanical efficiency,(iii) bsfc, and (iv) Brake thermal efficiency 7M

b Explain about different stages of combustion in CI engine. 5M

UNIT-II

3 **a** A single stage single acting air compressor delivers 0.6 kg of air per minute at 6 bar. The temperature and pressure at the end of suction stroke are 30^0 C and 1 bar. The bore and stroke of the compressor are 100 mm and 150 mm respectively. The clearance is 3% of the swept volume. Assuming the index of compression and expansion to be 1.3, find (i) Volumetric efficiency of the compressor, (ii) Power required to drive the compressor.(iii) Speed of the compressor. 7M

b What do you mean by multistage compression? State its advantages. 5M

OR

4 **a** A two stage air compressor compresses air from 1 bar and 20°C to 42 bar. If the law of compression is $pv^{1.3}$ = constant and the inter cooling is perfect. Find per kg of air (i) The work done in compression. 7M

b Derive the relation for work done on single stage reciprocating compressor without clearance. 5M

UNIT-III

5 **a** Steam at a pressure of 15 bar and 250^0 C is expanded through a turbine at first to a pressure of 4 bar. It is then reheated at constant pressure to the initial temperature of 250^0 C and is finally expanded to 0.1 bar. Using mollier chart, estimate the work done per kg of steam and amount of heat supplied. 7M

b State the advantages and disadvantages of a Reheat cycle. 5M

OR

6 **a** In a single heater regenerative cycle the steam enters turbine at 30 bar,400^0 C and the exhaust pressure is 0.10 bar. The feed water heater operates at 5 bar. Calculate efficiency and steam rate of cycle. Pump work may be neglected. 7M

b Explain with the help of neat diagram about Regenerative Cycle. 5M

UNIT-IV

7 **a** Dry saturated steam at 2.8 bar is expanded through a convergent nozzle to 1.7 bar. The exit area is 3 cm^2. Calculate the exit velocity and mass flow rate for isentropic expansion 7M

b Explain various types of nozzles with neat sketch. 5M

OR

8 **a** What is the effect of friction on the flow through a nozzle? Explain it with the help of h-s diagram. 7M

b Derive an expression for velocity of steam at exit of nozzle. 5M

UNIT-V

9 **a** Explain the working principle of De-Laval turbine with neat sketch 7M

b Draw the combined velocity triangle of Impulse turbine and explain the salient features. 5M

OR

10 **a** Steam enters the blade row of an impulse turbine with a velocity of 600m/s at an angle of 25^0C to the plane of rotation of the blades. The mean blade speed is 250m/s. the plant angle at the exit side is 30^0. The blades friction less is 10%. Determine i) The blades angle at inlet ii) The work done per kg of steam iii) The diagram efficiency iv) The axial thrust per kg of steam per sec. 7M

b Compare Impulse turbine and reaction turbine. 5M

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