

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-I &II (OLD) EXAMINATION – SUMMER-2019****Subject Code: 110006****Date: 04/06/2019****Subject Name: Elements Of Mechanical Engineering****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) What is refrigeration? Explain working of vapour compression refrigeration cycle. Name the basic components of VCRC **07**
- (b) What is Adiabatic process? Prove with usual notations the governing equation for adiabatic process  $PV^\gamma = \text{Constant}$  **07**
- Q.2** (a) Calculate the enthalpy per kg of steam at 10 bar pressure and a temperature of 300 °C. Find also the change in enthalpy if this steam is expanded to 1.4 bar and dryness fraction of 0.8. Take specific heat of superheat steam equal to 2.29 kJ/kgK. **07**
- (b) Define (i) Hardness (ii) Creep (iii) Resilience (iv) Toughness (v) Sensible heat (vi) Latent heat (vii) Dryness fraction. **07**
- Q.3** (a) With usual notations derive an expression for work done for single stage single acting reciprocating air compressor by considering clearance volume. **07**
- (b) State the function of (i) Fusible Plug (ii) Economiser (iii) Safety valves (iv) water level indicator (v) Superheater (vi) Pressure gauge (vii) Air pre-heater **07**
- Q.4** (a) Define the following terms related to belt drive: (i) Velocity ratio (ii) Initial Tension (iii) Slip (iv) Creep (v) Power transmitted in belt drive **07**
- (b) In ideal constant volume cycle the pressure & temperature at the beginning of compression are 97 KPa & 50° C respectively. The volume ratio is 8. The heat is supplied during the cycle is 930 kJ/kg of working fluid. Calculate: (i) The maximum temperature attained in the cycle. (ii) The thermal efficiency of cycle. (iii) Work done during the cycle /kg of working fluid. **07**
- Q.5** (a) List various liquid fuels. State their merits over solid fuels. **04**
- (b) What is priming? Why it is required in centrifugal pump? **03**
- (c) Explain with neat sketch construction and working of two stroke petrol engine **07**
- Q.6** (a) Differentiate between Fire tube and Water tube boiler. **03**
- (b) Explain working of Hartnell Governor with neat sketch **04**
- (c) Following readings were taken during test of single cylinder four stroke oil engine. (i) Cylinder diameter = 250 mm (ii) Stroke length = 400 mm (iii) Main effective pressure = 6.5 bar (iv) Engine speed = 250 r. p .m. (v) Net load on brake = 1080 Newton (vi) Effective diameter of brake = 1.5 meter (vii) Fuel used per hour = 10 Kg (viii) Calorific value of fuel = 44300 KJ/Kg Calculate (1) Indicated power, (2) Brake power, (3) Mechanical efficiency and (4) Indicated thermal efficiency. **07**
- Q.7** (a) Define Zeroth law, First law and Second law of thermodynamics. Give limitations of first law of thermodynamics **07**
- (b) Discuss construction, Specification and working of Cochran boiler with sketch. **07**