Seat No.: _____ Enrolment No._____

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^{γ} = Constant	**07**
Q.2	**(a)**	Calculate the enthalpy per kg of steam at 10 bar pressure and a temperature of 300 ^{o}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 stoke 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**