Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–1/2 (NEW) EXAMINATION – WINTER 2017

Subject Code: 2110006 Date: 02/01/2018

Subject Name: Elements of Mechanical Engineering

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Question No. 1 is compulsory. Attempt any four out of remaining Six questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of steam tables is permitted.**

Q.1 Objective Question (MCQ) **Mark**

(a) **07**

1. Bio fuels can be produced from
(a) Biomass (b) agricultural waste (c) Municipal garbage (d) all of the above.

2. Which of the following is high grade energy
(a) work (b) heat (c) chemical energy (d) none of the above

3. In a compressor, the work done is 200kJ and heat rejected to the surrounding is 50kJ. The change in internal energy is
(a) 150kJ (b) 250kJ (c) 4kJ (d) 10000kJ

4. Air is assumed to be
(a) Ideal gas (b) Real gas (c) Condensed gas (d) none of the above.

5. Dryness fraction of fully wet steam is
(a) 0 (b) 1 (c) 0.5 (d) none of the above

6. Air standard Otto cycle is also called
(a) Constant volume cycle (b) constant pressure cycle (c) dual pressure cycle (d) isothermal cycle

7. Which of the following is boiler mounting
(a) Super heater (b) Air preheater (c) Economizer (d) Blow off cock

(b) **07**

1. In a two stroke engine ports are operated by movement of
(a) Crank (b) Piston (c) Connecting rod (d) Piston pin

2. The process of filling liquid in casing of pump is
(a) charging (b) pre-starting (c) idling (d) Priming

3. The unit of specific fuel consumption is
(a) Kg/sec (b) kg/kWh (c) kg/kW (d) none of the above

4. The compressor used in aircrafts is
(a) Axial flow (b) Roots blower (c) Vane blower (d) Reciprocating compressor

5. Refrigerant used in domestic refrigerators is generally
(a) R134a (b) carbon dioxide (c) oxygen (d) ammonia

6. The size of gear is specified by
(a) Number of teeth (b) pitch circle diameter (c) pressure angle (d) none of the above

7. Mild steel contains % of carbon
(a) 0 to 0.5 (b) 0.5 to 1 (c) 1 to 2 (d) 2 to 4.

Q.2	**(a)**	Explain the following: Global Warming, Ozone depletion.	**03**
	(b)	An engine operating on the ideal diesel cycle has a maximum pressure of 45 bar and a maximum temperature of 1500°C. The pressure and temperature of air at the beginning of compression stroke are 1 bar and 27°C resply. Find the air standard efficiency of the cycle. Assume γ=1.4	**04**
	(c)	What is adiabatic process? Prove with usual notations the law of governing adiabatic process as PV^{γ} = Constant.	**07**
Q.3	**(a)**	With usual notations derive expression for air standard efficiency of Otto cycle.	**03**
	(b)	Draw neat sketches of following: Cochran boiler, bourden pressure gauge.	**04**
	(c)	During a test on a single cylinder four stroke engine having compression ratio of 6, the following data is recorded, Bore=10 cm, stroke =12.5 cm, IMEP =2.6 bar, dead load on dynamometer =60 N spring balance reading =19N, Effective radius of fly wheel =40 cm, fuel consumption =1 kg/hr calorific value of fuel is 42000 K J/ Kg speed=2000rpm. Determine indicated power, brake power, mechanical efficiency, overall efficiency, air standard efficiency and relative efficiency.	**07**
Q.4	**(a)**	List advantages and disadvantages of two stroke engines over four stroke engines	**03**
	(b)	Write short note on : Gear Pump	**04**
	(c)	With neat sketch explain construction and working of Super heater.	**07**
Q.5	**(a)**	Differentiate between reciprocating pump and centrifugal pump.	**03**
	(b)	Define following terms: swept volume, clearance volume, stroke length, compression ratio.	**04**
	(c)	Calculate mass of $0.2m^3$ of steam at 10 bar pressure having dryness fraction of 0.7. Also calculate enthalpy, internal energy, and external work during evaporation of 2 m^3 of steam.	**07**
Q.6	**(a)**	List properties and application of Titanium and its alloys.	**03**
	(b)	Define following terms: Ductility, Resilience, Hardness, and Elasticity.	**04**
	(c)	Compare belt drive, chain drive and gear drive.	**07**
Q.7	**(a)**	With neat sketch explain construction and working of cone clutch.	**03**
	(b)	Draw neat and labeled sketches only of following: Protected flange coupling, internal expanding shoe brake, Band brake.	**04**
	(c)	With neat sketch explain construction and working of split air conditioner.	**07**

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