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# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

## ELEMENTS OF MECHANICAL ENGINEERING

Time: 3 Hours

(CE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

### UNIT – I

1. (a) Classify different types of thermodynamic systems [7M]
- (b) The properties of a closed system change following the relation between pressure and volume as  $PV=3.0$ . Where P is in bar V is in  $m^3$ . Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar. [7M]
2. (a) Explain in detail about different energy resources? [7M]
- (b) An engine cylinder has a piston area  $0.12m^2$  and contains gas at a pressure of 1.5 MPa. The gas expands according to a process which is represented by a straight line on PV diagram. The final pressure is 0.15 MPa. Calculate the work done by the gas on the piston if the stroke is 0.30m. [7M]

### UNIT – II

3. (a) Explain the construction and working of a Lancashire boiler? [7M]
- (b) A vacuum gauge connected to a tank reads 30 kPa at a location where the barometer reads 755 mm Hg. Calculate the absolute pressure in the tank assuming density of Hg to be  $13,590 kg/m^3$ . [7M]
4. (a) State various processes in a Carnot cycle with neat P-V diagram and derive its thermal efficiency? [7M]
- (b) Calculate the specific volume and the specific enthalpy of steam at 35% quality and pressure of 20kPa. [7M]

### UNIT – III

5. (a) Write the differences between petrol engine and diesel engine. [7M]
- (b) In a laboratory experiment, the following observations were noted during the test of a four stroke Diesel engine: area of indicator diagram= $420mm^2$ ; length of indicator diagram=62mm; spring number=1.1bar/mm; diameter of piston =100mm; length of stroke=150mm; engine speed=450rpm. Determine: (i) Indicated mean effective pressure, and (ii) Indicated power. [7M]

6. (a) Describe vapour absorption refrigeration system with a neat sketch. [7M]
- (b) A vapour compression refrigerator work between the pressure limits of 60 bar and 25 bar as shown in Table 1. The working fluid is just dry at the end of compression and there is no under cooling of the liquid before the expansion valve. Determine (i)C.O.P. of the cycle; and (ii) Capacity of the refrigerator if the fluid flow is at the rate of 5kg/min. [7M]

Table 1

Pressure Bar	Saturation Temperature K	Enthalpy, (kJ/Kg)		Entropy, (kJ/Kg K)	
		Liquid	Vapour	Liquid	Vapour
60	295	61.9	208.1	0.197	0.703
25	261	-18.4	234.5	-0.075	0.896

#### UNIT – IV

7. (a) Draw and explain taper turning operation by compound rest method. [7M]
- (b) Differentiate between polar robot configuration and spherical robot configuration. [7M]
8. (a) What is NC machine? Differentiate between NC and CNC Machine. [7M]
- (b) Discuss computer numeric control machine with a neat sketch and list out the advantages of computer numeric control. [7M]

#### UNIT – V

9. (a) Discuss the working principle of Metal Inert Gas (MIG) Welding with neat sketch. [7M]
- (b) Differentiate between friction welding and friction stir welding. [7M]
10. (a) List the advantages and limitations of composite material over conventional materials. [7M]
- (b) Discuss in detail about the applications of composite in aircrafts. [7M]

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