Reg. No. : | | | | | | | | | | |

Question Paper Code: 31801

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Electronics and Instrumentation Engineering

(Common to Instrumentation and Control Engineering)

01UME421 – THERMODYNAMICS AND FLUID MECHANICS

(Use of steam tables is permitted)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define system and surrounding.
2. State zeroth law and first law of thermodynamics.
3. Name the basic thermodynamic cycles of two types of internal combustion reciprocating engines.
4. State the effect of reheating on Rankine cycle.
5. Classify the various types of air compressors.
6. Mention the difference between air conditioning and refrigeration.
7. What is meant by capillarity?
8. Write down Hagen-Poiseuille equation for laminar flow.
9. State the limitations of Bernoulli's theorem.
10. List the causes of minor energy losses in flow through pipes.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive the expression for steady flow energy equation and explain the application of steady flow energy equation to various engineering systems. (16)

Or

(b) A turbine operates under steady flow conditions, receiving steam at the following state: Pressure 1.2 MPa, temperature 188°C, enthalpy 2785 kJ/kg, velocity 33.3 m/s and elevation 3 m. The steam leaves the turbine at the following state: Pressure 20 kPa, enthalpy 2512 kJ/kg, velocity 100 m/s, and elevation 0 m. Heat is lost to the surroundings at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, what is the power output of the turbine in kW. (16)

12. (a) Drive an expression for the mean effective pressure of an Otto cycle. (16)

Or

(b) An engine works on Otto Cycle. The initial pressure and temperature of the air is 1 bar and 40˚C. 825 KJ of heat is supplied per Kg of air at the end of the compression. Find the temperature and pressure at the salient points if the compression ratio is 6. Also find the efficiency and mean effective pressure for the cycle. Assume air is used as working fluid and take all ideal conditions. (16)

13. (a) Describe the working of summer air conditioning system suitable for hot and wet weather and for hot and dry weather with simple component diagrams. (16)

Or

(b) A refrigeration system of 10.5 tones capacity at an evaporator temperature of 12°C and a condenser temperature of 27°C is needed in a food storage locker. The refrigerant ammonia is sub cooled by 6°C before entering the expansion valve. The vapour is 0.95 dry as it leaves the evaporator coil. The compression in the compressor is of adiabatic type. Find (i) Condition of vapour at the outlet of the compressor (ii) Condition of vapour at the entrance of the evaporator (iii) COP and (v) The power required. Neglect valve throttling and clearance effect. (16)

14. (a) A horizontal venturimeter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180 mm of mercury. If $C_d = 0.98$, determine the rate of flow. (16)

Or

(b) Explain the properties of a hydraulic fluid. (16)

15. (a) Derive an expression for head loss through pipes due to friction. (16)

Or

(b) Derive Bernoulli's equations and also state its practical applications. (16)

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