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

Question Paper Code: 34721

B.E. / B.Tech. DEGREE EXAMINATION, AUGUST 2021

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: 1:45 hour Maximum: 50 Marks

PART A - (10 x 2 = 20 Marks)

(Answer any ten of the following questions)

1. Give the Kelvin Planck's statement of Second law of Thermodynamics.
2. State zeroth law and first law of thermodynamics.
3. Define: Mean effective pressure.
4. State the effect of reheating on Rankine cycle.
5. Mention the important application of compressed air.
6. Define: Specific humidity and Relative humidity.
7. What is meant by capillarity?
8. What are the parameters depending on the magnitude of capillary?
9. State the limitations of Bernoulli's theorem.
10. Define the major energy losses in pipes.
11. Define system and surrounding.
12. State second law of thermodynamics.

13. What are the assumptions made in analysis of air standard cycles?

14. Why Carnot cycle cannot be realized in practice for vapour power cycles?

15. Give two merits of rotary compressor over reciprocating compressor.

PART – B (3 x 10= 30 Marks)

(Answer any three of the following questions)

16. In a gas turbine installation, air is heated inside the heat exchanger up to 750 ^{o}C from the ambient temperature of 25 ^{o}C. Hot air then enters into the gas turbine with the velocity of 50 *m/s* and leaves at 600 ^{o}C. Air leaving the turbine enters the nozzle at 60 *m/s* velocity and leaves the nozzle at temperature of 500^{o}C. For unit mass flow rate of air, determine the following assuming adiabatic expansion in turbine and nozzle.
    (i) Heat transfer to air in heat exchanger.
    (ii) Power output from the turbine.
    (iii) Velocity at the exit of nozzle. (10)

17. Drive an expression for the mean effective pressure of an Otto cycle. (10)

18. A single stage double acting air compressor takes air at 0.98 *bar* and 32 ^{o}C and delivers at 6.32 *bar*. The clearance is 5 *%* of the stroke volume. Te compression and expansion follow the law $PV^{1.32} = C$. The air handled by the compressor is 17 m^3 */min*. When measured at 1 *bar* and 15 ^{o}C. Determine the temperature of air delivered, stroke volume and Indicated power of compressor in *kW*, if it runs at 500 *rpm*. Neglect the area of the piston rod and Take $R = 0.287$ *kJ / kg K*. (10)

19. 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. (10)

20. Derive an expression for head loss through pipes due to friction. (10)