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

Question Paper Code: 41744

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

Fourth Semester

Electronics and Instrumentation Engineering

14UME421 - THERMODYNAMICS AND FLUID MECHANICS

(Common to Instrumentation and Control Engineering)

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of the following is an intensive property of a thermodynamic system?

   (a) Volume (b) Temperature (c) Mass (d) Energy

2. According to the First law of thermodynamics

   (a) Mass and energy are mutually convertible
   (b) Carnot engine is more efficient
   (c) Heat and work are mutually convertible
   (d) Mass and light are mutually convertible

3. Efficiency of Diesel cycle approaches to Otto cycle efficiency when cut off is

   (a) increased (b) decreased (c) zero (d) constant

4. Steam power plants using coal work closely on known which of the following cycle?

   (a) Otto cycle (b) Binary vapour cycle
   (c) Brayton cycle (d) Rankine cycle

5. The ratio of the volume of free air delivery per stroke to the swept volume of the piston, is known as

(a) compressor efficiency (b) volumetric efficiency
(c) isothermal efficiency (d) mechanical efficiency

6. The COP of a vapour compression refrigeration in comparison with vapour absorption refrigeration is

(a) more (b) less
(c) same (d) depending upon size of plant

7. The property that most determines whether an object will float or not in oil is the object's

(a) weight (b) density (c) mass (d) volume

8. Which of the following manometer has highest sensitivity?

(a) U tube with water (b) U tube with mercury
(c) Inclined U tube with mercury (d) Micro-manometer with water

9. A flow through a long pipe at constant rate is called

(a) steady uniform flow (b) steady non-uniform flow
(c) unsteady uniform flow (d) unsteady non-uniform flow

10. Bernoulli's equation deals with the law of conservation of energy

(a) Mass (b) Momentum (c) Energy (d) Force

PART - B (5 x 2 = 10 Marks)

11. State the law of thermodynamics which governs the concept of equilibrium.

12. Illustrate the P-V and T-S diagram of Otto cycle.

13. Define ton of refrigeration.

14. Define vapour pressure

15. Explain the significance of Moody diagram.

PART - C (5 x 16 = 80 Marks)

16. (a) Derive the steady flow energy equation. (16)

Or

(b) State and prove Carnot theorem. (16)

17. (a) Derive an expression for air standard efficiency of diesel cycle with p-v and T-s diagram. (16)

Or

(b) With the help of a neat layout explain the working principle of a steam power plant. (16)

18. (a) Explain the effect of clearance volume on the volumetric efficiency of air compressor with proper diagrams and derivation. (16)

Or

(b) With the help of a neat sketch, explain the working principle of vapour compression refrigeration system. (16)

19. (a) State and prove Pascal's law. (16)

Or

(b) A U-Tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs of U- tube is 10 *cm* and the free surface of mercury is in level with the centre of the pipe. (16)

20. (a) Derive the Darcy – Weisbach equation. (16)

Or

(b) Formulate the theorem which provides the basics for the working of venture meter and orifice meter mentioning the assumptions made and their limitations, if any. (16)

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