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

Question Paper Code: 41747

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. What is meant by principle of increase of entropy?
3. What are the assumptions made in analysis of air standard cycles?
4. Why Carnot cycle cannot be realized in practice for vapour power cycles?
5. List the advantages of multistage compressor over single stage compressor.
6. State the substances used in the lithium bromide system and their functions.
7. What is the difference between ideal and real fluids?
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.

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) (i) Prove that violation of Kelvin-Planck statement will violate the Clausius statement. (8)

(ii) A Carnot engine works between 300 ^{o}C and 30 ^{o}C. The heat supplied to the engine is 20 *kJ*. Determine: (1) Efficiency (2) Work output (3) Heat rejection. (8)

12. (a) (i) Drive an expression for the mean effective pressure of an Otto cycle. (8)

(ii) A diesel engine has a compression ratio of 10 and head addition takes place at constant pressure at 8 % of stroke. Find the air standard efficiency of the engine. Take $\gamma = 1.4$ (8)

Or

(b) A steam turbine plant working on a single stage of regenerative feed heating receive steam at *30* bar and *300*^{o}C, the turbine exhausts to a condenser at *0.15* bar, while the bled steam is at *3* bar. Assuming that the cycle uses actual regenerative cycle. Calculate the thermal efficiency of cycle. Compare this value with a Ranking cycle operating between same boiler and condenser pressures. (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) (i) With a sketch, explain the working of a vapour compression refrigeration system. (8)

(ii) Discuss the requirement of a summer air conditioning system. Draw a schematic of the same. (8)

14. (a) A shaft of *69 mm* diameter rotates concentrically inside a cylinder of diameter *70 mm*. Both the cylinder and shaft are *80 mm* long. Find the tangential velocity and speed in rpm of the shaft, if there is a space between the cylinder and shaft and the cylinder is filled with an oil of viscosity *2.35 poise* and a torque of *1.37 N-m* is applied. (16)

Or

(b) (i) What are mechanical gauges? Explain with a neat sketch the working of any one type of mechanical gauge. (8)

(ii) U-tube manometer containing mercury was used to find the negative pressure in the pipe, containing water. The right limb was open to the atmosphere. Find the vacuum pressure in the pipe, if the difference of mercury level in the two limbs was 100 *mm* and height of water in the left limb from the centre of the pipe was found to be 40 *mm* below. (8)

15. (a) Derive the Hagen-Poiseuille equation for laminar flow through a round pipe and state the assumptions made. (16)

Or

(b) (i) Mention the minor losses that occur in flow through pipes. (6)

(ii) In a pipe of diameter 350 *mm* and length 75 *m* water is flowing at velocity of 2.8 *m/s*. Find the head lost due to friction using Darcy-Weisbach formula. (10)

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