KUMARAGURU
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Register Number: ……………………..

B.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Fourth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

MEC 212**:** Thermal Engineering and Fluid Mechanics

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1.   The first law of thermodynamics was given by

   a)   Joule   b)   Charles

   c)   Wilson   d)   James watt

2.   It is impossible to construct an engine which, while operating in a cycle , produces no other effect expect to extract the heat from a single temperature reservoir and do equivalent amount of work.

   a)   It refers to clasius statement   b)   It refers to kelvine-planck's statement

   c)   It refers to carnot's theorem   d)   It refers to clasius theorem

3.   Which one of the following is most popular vapour power cycle

   a)   Carnot cycle   b)   Rankine cycle

   c)   Joule cyc;e   d)   Binary cycle

4.   In the Rankine cycle, heat is added

   a)   Isothermally   b)   At constant volume

   c)   At constant pressure   d)   Adiabatically

5.   For isothermal compression in a compressor , the compressor should run at

   a)   Very high speed   b)   Very low speed

   c)   Constant speed   d)   None of the above

6.   In summer air conditioning , the air is

   a)   Cooled   b)   Cooled and dehumidified

   c)   Heat and humidified   d)   Cooled and humidified

7. Newton's law of viscosity states that

    a) Shear stress is directly proportional to velocity
    b) Shear stress is directly proportional to velocity gradient
    c) Shear stress is directly proportional to shear strain
    d) Shear stress is directly proportional to viscosity

8. Surface tension has the units of

    a) Force per unit area
    b) Force per unit length
    c) Force per unit volume
    d) None of the above

9. The flow in pipe is laminar if

    a) Reynolds number is equal to 2500
    b) Reynolds number is equal to 4000
    c) Reynolds number is more than 2500
    d) None of the above

10. Bernoulli's theorem deals with the law of conservation of

    a) Mass
    b) Momentum
    c) Energy
    d) None of the above

PART B (10 x 2 = 20 Marks)

11. What is meant by Thermodynamic systems? How do you classify it?

12. State Carnot's theorem.

13. Name the different process of Rankine cycle on T-S Diagram.

14. Difference between Impulse and Reaction Turbine.

15. Point out the relevance of compressed air in Industries.

16. What is sub cooling? What is its effect on COP of vapour compression system?

17. Define fluid and fluid mechanics.

18. What are the characteristics of Turbulent flow?

19. State Bernoulli's Equation.

20. Give an expression for loss of head due to sudden enlargement of the pipes.

PART C (5 x 14 = 70 Marks)

21. a) Derive the steady flow energy equation of first – law of thermodynamics with engineering applications.

(OR)

21. b) A reversible heat engine operating between reservoirs at 900 K and 300 K drives a reversible refrigerator operating between reservoirs at 300 K and 250 K. The heat engine receives 1800 kJ heat from 900 K reservoir .The net output from the combined

engine refrigerator is 360 kJ. Find the heat transferred to the refrigerator and the net heat rejected to the reservoir at 300 K.

22. a) Find the internal energy of unit mass of steam at a pressure of 7 bar (i) when its quality is 0.8 (ii) when it is dry and saturated and (iii) super heated, the degree of superheat being $65^{°}$ C. The specific heat of superheated steam at constant pressure is 2.227 kJ/kg K.

(OR)

22. b) Sketch and enlighten the layout of the thermal power plant in detail with P- V diagram.

23. a) Illustrate the working of a centrifugal compressor and axial compressor with precise sketch and applications.

(OR)

23. b) What is meant by Refrigeration process? Make clear about Vapour compression refrigeration cycle with P-h diagram and inscribe its applications.

24. a) Calculate the capillary effect in mm in a glass tube of 4mm diameter, when immersed in 1.water and 2.mercury.The temperature of the liquid is $20^{°}$C and the values of surface tension of water and mercury at $20^{°}$C in contact with air are 0.073575N/m and 0.51N/m respectively. The angle of contact for water is zero that for mercury is 1.30 degree. Take density of water at $20^{°}$C as equal to 998 kg/m^3.

(OR)

24. b) A 30cm diameter pipe conveying water, branches into two pipes of diameters 20cm and 15cm respectively. If the average velocity in the 30cm diameter pipe is 2.5m/s, find the discharge in the pipe. Also determine the velocity in 15cm pipe if the average velocity in 20cm diameter pipe is 2m/s.

25. a) (i) An oil of sp. Gr. 0.8 is flowing through a venturimeter having inlet diameter (7) 20cm a throat diameter 10cm .The oil mercury differential manometer shows a reading of 25cm.Calculate the discharge of oil through the horizontal venturimeter take c_d=0.98.

   b) (ii) An orifice meter with orifice diameter 15cm is inserted in a pipe of 30cm (7) diameter. The pressure measured by a mercury oil differential manometer on the two sides of a orifice meter gives a reading of 50cm of mercury. Find the rate of flow oil of specific gravity 0.9 when the co-efficient of discharge of meter =0.69.

(OR)

25. b) A main pipe divided into two parallel pipes which again forms one pipe. The length and diameter for the first parallel pipe are 2000m and 1.0m respectively while the length and diameter of the second parallel pipe are 2000m and 0.8m.Find the rate of flow of each parallel pipe, if the flow in the main is 3.0m^3/s. The co-efficient of friction for each parallel pipe is same and equal to 0.005.

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