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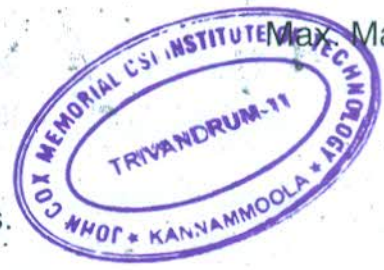
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Combined First and Second Semester B.Tech. Degree Examination, December 2015
(2013 Scheme)
13.107 : BASIC MECHANICAL ENGINEERING (ACEFRT)

Time : 3 Hours   Max. Marks : 100

PART – A

Answer **all** questions. **Each** question carries **2** marks.

1. How are thermodynamic systems classified ? Explain the importance of each type.

2. State the difference between heat engine, heat pump and refrigerator with block diagrams.

3. Write the units of absolute viscosity, kinematic viscosity and surface tension.

4. What do you mean by compression ratio of an engine ? Why is it limited from 6 to 10 in petrol engines ?

5. List the advantages of fluidized bed combustion boilers.

6. Which type of turbine is installed in Idukki hydraulic power plant and why ?

7. Sketch gas turbine cycle on PV and TS diagrams.

8. Show the line diagram of a simple vapour compression refrigeration system and name the basic components.

9. What are the advantages and disadvantages of EDM ?

10. Compare the processes of soldering and brazing.

P.T.O.

PART – B

Answer **any one full** question from **each** Module. **Each** question carries **20** marks.

Module – I

11. a) Explain the first law of thermodynamics and hence show that cyclic integral of δQ and cyclic integral of δW are equal for a closed system undergoing a cycle.   **8**

    b) Derive the steady flow energy equation with assumptions.   **8**

    c) Define reversibility and entropy.   **4**

12. a) Derive Bernoulli's equation for the flow of a frictionless, incompressible fluid and state the assumptions.   **8**

    b) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720 mm. The thickness of the oil film is 15 mm. The upper plate, which moves at 3 m/s, requires a force of 120 N to maintain the speed. Determine :
      i) the dynamic viscosity of the oil
      ii) the kinematic viscosity of oil if the specific gravity of oil is 0.95.   **8**

    c) Distinguish between :
      i) steady and unsteady flows
      ii) laminar and turbulent flows.   **4**

Module – II

13. a) The compression curve on the pressure-volume diagram of a gas engine working on Otto cycle follows the polytropic law $pv^{1.3}$ = constant. At two points on this curve at $1/4^{th}$ stroke and $3/4^{th}$ stroke, the pressures are measured to be 140 kN/m^2 and 360 kN/m^3. Determine the compression ratio of the engine. Calculate the gas consumption per kW hour if relative efficiency is 0.4 and the gas calorific value of 18840 kJ/m^3. The ratio of actual thermal efficiency to the air standard efficiency is known as relative efficiency.   **12**

    b) Explain the working of CRDI, MPFI and GDI engines with the help of neat sketches.   **8**

14. a) Explain the working of a water tube boiler with the help of a neat sketch. 10

    b) Explain the working of a two stroke petrol engine. 6

    c) Draw the circuit diagram for a magneto ignition system of a four cylinder petrol engine. 4

Module – III

15. a) Explain the working of a centrifugal pump with a neat sketch. 7

    b) Explain the working principle of an impulse steam turbine with the help of neat sketches. 7

    c) Explain the differences between fans, blowers and compressors. 6

16. a) Explain the working of a Pelton turbine with a neat sketch. 7

    b) Explain the working of a typical window air conditioning unit. 7

    c) Sketch the layout of a conventional thermal power plant. 6

Module – IV

17. a) An induction motor drives the main lay shaft of a flour mill by means of a flat belt. The diameter of the pulleys on the motor shaft and the lay shaft are 450 mm and 750 mm respectively. Another pulley of diameter 500 mm drives a flour mill having a 700 mm pulley keyed to it. If there is 3% slip between motor and the lay shaft and 2% slip between the lay shaft and the flour mill, determine the speed of the flour mill shaft if the motor runs at 1400 rpm. Neglect thickness of the belt. 8

    b) Explain the working of a single plate clutch. 8

    c) Write a short note on CNC machines. 4

18. a) Derive an expression for ratio of tensions in belt drives. 7

    b) Explain the following :
       i) Casting   ii) Forging   iii) Rolling. 9

    c) Write a short note on welding processes. 4

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