D 70380 (Pages : 2) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

EE 09 306/PTEE 09 305—MECHANICAL ENGINEERING

Time : Three Hours Maximum : 70 Marks

Part A

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

1. Define Dryness fraction of steam.
2. Define and explain (a) Fin effectiveness ; (b) Fin efficiency.
3. What do you mean by the term emissivity ?
4. Explain the term capillarity.
5. Define the term slip of a reciprocating pump.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Explain the term regeneration as applied to steam turbines.
7. With neat sketch, explain a practical Rankine cycle.
8. State and prove Kirchoff's law of radiation.
9. With the help of shear stress *vs.* velocity gradient graph, explain different types of fluids. State and prove hydrostatic law.
10. Explain why priming is necessary for a centrifugal pump.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

11. (a) In a steam turbine, steam at 20 bar and 633 K is expanded to 0.08 bar. It then enters a condenser where it condensed to saturated liquid water. The pump feeds back the water to the boiler. Assume ideal processes, find per kg. of steam, the network and cycle efficiency.

Or

(b) Explain different methods to improve the thermal efficiency of a steam turbine.

Turn over

12. (a) Derive an expression for the heat conduction through a hollow cylinder from basic fundamentals.

Or

(b) An oil cooler for a lubrication system has to cool 1000 kg./hr. of oil (Cp = 2.09 kJ/kg.K) from 353 K to 313 K by using a cooling water flow of 1000 kg./hr. at 303 K. Give your choice for a parallel flow or counter flow heat exchanger with reasons. Find the surface area of the heat exchanger if the overall heat transfer coefficient is 24 $W/m.^2K$.

13. (a) Derive the three dimensional continuity equation in rectangular co-ordinate system.

Or

(b) Explain different types of manometers.

14. (a) A centrifugal pump is to discharge 120 liters/s at a speed of 140 r.p.m. against a head of 25 m. The impellor diameter is 250 mm., its width at outlet is 50 mm. and manometric efficiency is 75 %. Find the vane angle at the outer periphery of the impellor.

Or

(b) A Pelton wheel with mean bucket diameter of 1 m. is running at 1000 rpm. The net head on the Pelton wheel is 700 m. If the side clearance angle is 15 degree and discharge through the nozzle is 100 liters/s find (i) Power available at the nozzle and (ii) Hydraulic efficiency of the turbine.

(4 × 10 = 40 marks)