

**D 51027**

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Name \_\_\_\_\_

Reg. No. \_\_\_\_\_

**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, NOVEMBER 2013**

**EE 09 306/PTEE 09 305—MECHANICAL ENGINEERING**

Time : Three Hours

Maximum : 70 Marks



**Part A**

*Answer all questions.*

1. Differentiate between sensible and latent heat.
2. Define and explain : (a) Nusselt Number ; (b) Grashoff Number.
3. What is a gray body ?
4. State the assumptions made while deriving the Bernoulli's equation.
5. Define NPSH.

(5 × 2 = 10 marks)

**Part B**

*Answer any four questions.*

6. Explain the use of steam tables.
7. With neat sketch explain the difference between an ideal and actual Rankine cycle.
8. Derive an expression for the critical radius of insulation for a cylinder.
9. What is a fin ? Explain the classification of fins.
10. Differentiate between Venturi meter and Orifice meter.
11. Explain different efficiencies of a centrifugal pump.

(4 × 5 = 20 marks)

**Part C**

*Answer all questions.*

12. (a) Define and explain the term isentropic efficiency of a turbine. (4 marks)
- (b) In a steam power cycle steam supply is at 15 bar and dry saturated. The condenser pressure is 0.4 bar. Neglecting pump work calculate the Rankine and Carnot efficiencies of the cycle. (6 marks)

*Or*

- (c) In a Rankine cycle, the steam at inlet to the turbine is saturated at a pressure of 35 bar and the exhaust pressure is 0.2 bar. Find (i) The turbine and pump work ; (ii) The Rankine efficiency. (10 marks)

**Turn over**

13. (a) Derive three dimensional heat conduction equation in rectangular coordinate system.

*Or*

- (b) Calculate the net radiant heat exchange per  $m^2$  area for two large parallel plates at temperatures of  $427^\circ\text{C}$  and  $27^\circ\text{C}$  resp.  $\epsilon$  for hot plate is 0.9 and for cold plate it is 0.6. If a polished aluminium shield is placed between, find the % reduction in heat transfer if  $\epsilon$  for shield is 0.4.

14. (a) Petrol of specific gravity 0.87 flows upward through a vertical pipe. A and B are two points in the pipe. B being 0.3 m higher than A. Connections are led from A and B to a U-tube manometer containing mercury. If the difference of pressure between A and B is  $1.8 \text{ N/cm}^2$ , find the reading shown by the differential mercury manometer.

*Or*

- (b) A 125 mm diameter vertical cylinder rotates concentrically inside a fixed cylinder of diameter 130 mm. Both cylinders are 325 mm long. Find the dynamic viscosity of the liquid that fills the space between the cylinders if a torque of 0.92 Nm is required to maintain a speed of 70 r.p.m.

15. (a) Explain the characteristic curves of a centrifugal pump.

*Or*

- (b) With neat sketch, explain the working principle of a draft tube. What you meant by efficiency of a draft tube ?

(4 × 10 = 10 marks)