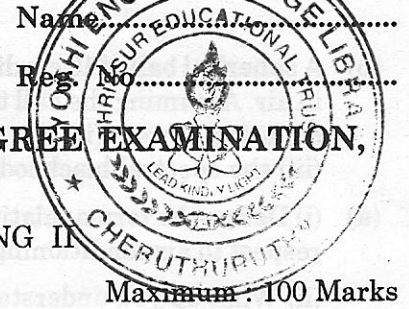C 15297

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FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2010

EE 2K 403—MECHANICAL ENGINEERING II

Time : Three Hours   Maximum : 100 Marks

Answer **all** *questions*

I. (a) State and prove Pascal's law.

  (b) Derive the expression for the metacentric hight of a floating body.

  (c) Explain the difference between an impulse turbine and a reaction turbine?

  (d) What are the advantages of centrifugal pumps over reciprocating pumps.

  (e) Explain the tree basic modes in which heat is transferred.

  (f) Explain black body and gray body and give examples.

  (g) Name various psychrometric processes and show each of them on psychrometric chart?

  (h) Explain the selection of units and schedule of operation.

[8 × 5 = 40 marks]

II. (a) A pipe line which is 4 m in diameters contains a gate valve. The pressure at the centre of the pipe is 19.6 N/cm^2. if the pipe is filled with oil of specific gravity 0.87, Find the force exerted by the oil upon the gate and position of centre of pressure.

Or

  (b) State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's theorem from first principle and state the assumptions made for such a derivation.

III. (a) (i) The following data refers to a particular stage of a Parsons Reaction turbine :

      Speed of the turbine = 1500 r.p.m

      Mean diameter of the rotor = 1 metre

      Stage efficiency=80 percent

      Blade outlet angle = 20°

      Speed ratio = 0.7

      Determine the available isentropic enthalpy drop in the stage.

    (ii) What do you mean by combined velocity diagram with reference to steam turbines?

Or

  (b) The pressure difference ΔP in a pipe of diameter D and length 1 due to turbulent flow depends on the velocity V, Viscosity μ. Density ρ and roughness k. using Buckingham's PI theorem obtain an expression for ΔP.

IV. (a) An insulated steel road of 30 mm diameter and 0.5 m length connects two hot metallic plates at 100°C and 85°C. The rod is heated electrically by discharging electric energy at a rate of 20 W. Assuming the thermal conductivity of the rod to be 40 W/(m K), determine the heat flux at the ends of the rod, the maximum temperature in the rod, and the location of the temperature maximum, at steady state condition.

Turn over

Or

(b) A spherical ball of 10 cm diameter maintained at a constant temperature of 1100 K is suspended in air. Assuming the ball to closely approximate a blackbody. Determine (i) the total blackbody emissive power, (ii) the total amount of radiation emitted by the ball in 10 minutes, and (iii) the spectral blackbody emissive power at a wavelength of 3 μm.

V. (a) (i) Define the terms relative humidity and specific humidity and illustrate its application with respect to air conditioning?

(ii) What do you understand by air conditioning and what are its applications in modern day living.

Or

(b) What is meant by depreciation of the equipment? Discuss the methods to calculate the deprecation cost.

$$[4 \times 15 = 60 \text{ marks}]$$