D 51598 (Pages 2) Name.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, DECEMBER 2008

EC 04 502—MECHANICAL ENGINEERING

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

I. (a) Explain Themodynamics systems with examples.

(b) What are the different Temperature scales ?

(c) List the Engineering applications of Thermodynamics clearly indirecting the warley fluid.

(d) Sketch Molian diagram and explain its use.

(e) Explain basic modes of heat transfer.

(f) What is Fourier Law of Conduction ?

(g) What is 'Pitot tube' ?

(h) Explain Bernoulli's Equation.

(8 × 5 = 40 marks)

II. (a) 0.3 m^3 of air weighing 1 kg at an initial pressure of 5.5 kg/cm^2 ab, Expands to a final volume of 0.5 m^3. If the expansion according to the law $PV^{1.3} = C$ find : (1) The change in internal energy ; (2) Heat absorbed during the process and show that it is approximately equal to change of entropy multiplied by mean absolute temperature.

Or

(b) A reversible engine receives heat from a mixture of water vapour and liquid water at 1 atm and rejects 3750 kJ/hr of heat to a mixture of ice and liquid water at 1 atm. It delivers 0.386 kW power. Find the number of degrees seperating absolute zero and ice point on Kelvin scale.

(15 marks)

III. (a) A diesel engine working on an ideal cycle having a compression ratio of 14, takes in a change of air at a pressure of 1.1, kg/cm^2 ab and temperature of 30°C. If the cut-off take place at 5 per cent of the stroke, find :

(i) The ideal Thermal efficiency.

(ii) Ideal mean effective pressure of the cycle in kg/cm^2

take $\gamma = 1.4$ and $C_v = 0.1715$ for air.

Or

(b) Which undergoing a carnot cycle, the working fluid receives heat at a temperature of 317°C and rejects at 22°C. Find the theoretical efficiency of the cycle. If the engine working on this cycle absorbs 500 kcal/minute from the hot body, calculate the network done and theoriticed horse power of the engine ?

(15 marks)

IV. (a) Derive an expression for heat transfer between the fluids Through a cylindrical wall.

Or

(b) Water flows inside a tube 5 cm in diameter and 3 meter long at a velocity 0.8 m/s. Determine the heat transfer coefficient. and the rate of heat transfer if the mean water temperature is 50°C and the wall is ISO thermal at 70°C.

For water at 60°C take K = 0.66 w/mk, $\upsilon = 0.478 \times 10^{-6}$ m^2/s and $P_v = 2.98$.

(15 marks)

V. (a) A Borda mouthpiece 6 cm in diameter has discharge coefficient 0.52. Determine the diameter of the issuing jet.

Or

(b) A 2 mm diameter glass tube is immersed in mercury. Estimate the depression if the surface tension for mercury is 0.472 N/m and the contact angle is 125°.

(15 marks)

[4 × 15 = 60 marks]