

SE-Mech.  
Sem III (CBCSGs)  
TDY  
(3 Hours)

26/11/2014  
QP Code : 14568  
[Total Marks : 80

- NB:-
- i) Question no. 1 is compulsory
  - ii) Answer any three questions from remaining
  - iii) Use of steam table & Mollier chart is permitted.

- 1) Write a short note on any four of the following (5X4)
- a) Zeroth law and its significance
  - b) Absolute thermodynamic temperature scale
  - c) Principle of entropy increase and its applications
  - d) Joule- Thomson porous plug experiment
  - e) Reheat Rankine cycle
- 2) a) State and prove Clausius Theorem (8)
- b) A power washer is being used to clean the walls of house. Water at the rate of 0.1 kg/s enters at 20 °C and 1 atm, with the velocity 0.2 m/s. The jet of water exits at 23 °C, 1 atm with a velocity 50 m/s at an elevation of 5m. At steady state the magnitude of the heat transfer rate from power unit to the surrounding is 10% of the power input. Determine the power input to the motor in kW. (12)
- 3) a) Prove that the difference in heat capacities is  $C_p - C_v = \frac{TV\beta^2}{K_T}$  Where  $\beta$  is volume Expansivity and  $K_T$  is isothermal compressibility. (10)
- b) A household refrigerator is maintained at a temperature of 2°C. Every time the door is opened, warm material is placed inside introducing an average of 420 kJ, but making only a small change in the temperature of the refrigerator. The door is opened 20 times a day and the refrigerator operates at 15% of the Ideal COP. The cost of the work is 4 rupees per kWh. What is the monthly bill for this refrigerator? The atmosphere is at 30°C. (10)
- 4) a) The swept volume of an engine working on duel cycle is 0.0053 m<sup>3</sup> & clearance volume is 0.00035 m<sup>3</sup>. The maximum pressure is 65 bar. Heat addition ends at 5% of the stroke. The temperature & pressure at the beginning of compression are 80 °C & 0.9 bar respectively. Determine i) work done ii) Mean effective pressure iii) air standard efficiency. (10)

[TURN OVER

Correction  
attached.