EX/PG/EST/T/127A/ ~ /2018

M.Tech. (Energy Sc. & Technology) 2nd. Semester 2018

Advance Energy Management

Time 3 hr. Full Marks 100

Part I
(50 marks for each part)
Answer ***any three*** questions
Two marks for systemic answers
Use separate answer script for each part.

1. a) Discuss how U-value influences the performance of a building system. 04

   b) Define effectiveness of a heat exchanger. Discuss the limiting parameter of LMTD & ε-NTU method of analysis. 04

   c) With standard notation derive the expression for U-value for a glazing system. Discuss how the U-value is improvised when a double glazed system is considered. 05

   d) Define Integrated part load performance value (IPLV) as referred in ECBC- 2017 03

2. a) Discuss how would you utilize the zone concept in a building enclosure for the point of view of energy consumption monitoring. 04

   b) Define the term Cooling Load Temperature Difference and Cooling Load Factor 03

   c) Considering a window located in the western wall of a building and if it is proposed to block the direct solar radiation during summer season what would be your proposal for preventing direct solar radiation ingress in to the building and discuss it in details. 06

   d) State the parameter and its magnitude based on which ECBC – 2017 is implemented in a building system. 03

3. a) Define Cost Factor. Explain the steps to be taken for evaluating the Economic Thickness of thermal insulation for a system. 06

   b) While evaluating the cooling load of a building discuss the impact of "Thermal Inertia" on the system performance and also discuss the impact of stack effect in buildings 05

   c) For selecting an insulating material for a pipeline transporting brine at a subzero temperature, outline & discuss the major important properties to be considered with proper reasoning. 05

4. a) Define "Shading Coefficient" & " Solar Heat Gain Factor" 03

   b) A refrigerator consists of 2.5 mm steel sheet at the outer surface followed by 100 mm glass wool (K = 0.048 w/m^{o}k) and a layer of plywood (k= 0.06 w/m^{o}k) 16 mm thick at the inner surface. The inside temperature of the refrigerator has to be maintained at -10^{o} C where the outside ambient temperature is 32^{o} C. Find the heat flow into the system per unit area & also find the junction temperature. Total surface area of the refrigerator is 40 m^{2}. Also determine the capacity of the refrigerating plant [given 1 ton of refrigeration = 3.4 KW]. 07

   c) With standard notations derive the expression for a parallel flow heat exchanger. 04

   d) Define Envelop Performance Factor (EPF) 02

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M.Tech. Energy Science & Technology First Year Second Semester Examination - 2018

Subject: Advanced Energy Management

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(50 marks for each part)

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PART – II

Answer any three questions.

Two marks for neatness.

5. Discuss about the energy conservation strategies & methodologies for a certain establishment. What is an energy audit ? What are the basic steps involved in conducting energy audit in an industry – discuss in brief. 16

6. Calculate the unit cost of electricity generation from a coal-fired thermal power plant, if the capital cost of a coal-fired thermal power plant is Rs. 6.0 crore per MW and cost of coal and oil are Rs. 3.0 per kg and Rs. 60 per litre respectively. Assume a 9% yearly interest rate on the capital investment. 650 gm coal and 5 ml oil are required to generate one unit of electricity in a thermal power plant. Assume standard data if required. 16

7. a) Describe with a neat sketch the four-stroke operating cycle of the I.C. engine. 12

   b) Draw the typical fuel consumption curves of a SI and a CI engine showing the relationship between the brake specific fuel consumption and the brake mean effective pressure. 4

8. a) Write a short note on energy conservation techniques in road transport. 8

   b) Assume that 65% of all freight is currently carried by small trucks (less than 8 ton capacity) and that 35% is carried by large trucks (greater than 8 ton capacity). Restructure the truck dispatching system so that substantial reduction in energy consumption is achieved.

   Data given:

   i) Average specific energy consumption for the small trucks (less than 8 ton capacity) is 5.3 MJ/ton-km.

   ii) Average specific energy consumption for the large trucks (greater than 8 ton capacity) is 2.6 MJ/ ton-km.

   iii) A total freight of 1000 ton is transported per day to a distance of 100 km. 8