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BME-031

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

00180

Term-End Examination

June, 2015

BME-031 : ENERGY CONVERSION

Time : 3 hours *Maximum Marks : 70*

Note : *Answer any* ***seven*** *questions. Use of scientific calculator is allowed.*

1. (a) Describe the integrated power generating system for rural areas. *5*

(b) The daily output of an electric power generating station is 1,600 MWh and the coal consumption is 800 tonnes/day. If the calorific value of coal is 7,000 kcal/kg, calculate the thermal efficiency of the station. *5*

2. (a) What do you understand by life cycle costing ? Explain the total life cycle cost of photovoltaic system. *6*

(b) On the basis of the mode of energy conversion, state the devices that take part in the energy conversion in

(i) Railway transportation system,

(ii) Road transportation system. *4*

3. (a) Explain the terms 'Gross Calorific Value' and 'Net Calorific Value'. Define combustion efficiency. *5*

(b) Coal having gross calorific value of 33·5 MJ/kg consists of 5% hydrogen and 10% moisture. Determine the net calorific value of the coal, if the sensible heat of water vapour is 2·45 MJ/kg. *5*

4. (a) Derive a general relationship between area, velocity and pressure in nozzle flow. Give the physical significance. *5*

(b) With help of a diagram compare the different types of forces acting on the impulse and reaction steam turbine blades. *5*

5. (a) In a steady flow steam turbine system following data is given :

$h_1 = 3200$ kJ/kg, $C_1 = 10$ m/s, m = 2 kg/s,

$h_2 = 2800$ kJ/kg, $C_2 = 50$ m/s, $\Delta z = 3$ m.

(i) Find the work done by the turbine, if the heat loss is negligible.

(ii) Find the heat loss, if $W_x = 780$ kJ/s. *6*

(b) With the help of a suitable sketch, state the working principle of a reaction turbine. 4

6. (a) Classify the steam condensers. Draw the schematic of a condensing plant and show the essential components. 5

(b) Draw the schematic of an evaporative condenser. What are its special characteristics ? 5

7. (a) Define the terms 'Octane number', 'Cetane number', and 'Knocking'. How do you improve the Octane number of many poor fuels ? 5

(b) A tank having a volume of 100 litres contains 44 gm of CO_2, 120 gm of N_2 and 25 gm of O_2. What will be the pressure indicated by a gauge attached to a tank, if the gas temperature is 55°C ? 5

8. (a) What are the main advantages of water tube boilers over fire tube boilers ? Draw the schematic of a Benson boiler. 5

(b) Explain the complete cycle of operation for a 4-stroke diesel engine. 5

9. (a) Explain the various elements of a hydroelectric power plant. 5

(b) Describe the constant head and constant speed characteristics of water turbines. 5

10. (a) Briefly describe the alternating power generating processes which are most promising in future. *5*

(b) Discuss the principle of MHD power generation. *5*