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BME-031

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

01420

June, 2014

BME-031 : ENERGY CONVERSION

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of steam tables and calculator are allowed.*

1. (a) What are the different forms of energy ? Describe them in detail. 5

(b) What is the difference between direct and multistage conversion ? 5

2. (a) Explain the differences between 2-stroke and 4-stroke engines. 5

(b) A photovoltaic system is used to generate electrical power. The total area of the module is 5 m^2. At an intensity of solar radiation of 800 W/m^3, the system can generate 400 W. Find the conversion efficiency of the system. 5

3. The analysis of the dry exhaust from an internal combustion engine gave :

$12\%\ CO_2$; $2\%\ CO$; $4\%\ CH_4$; $1\%\ H_2$; $4{\cdot}5\%\ O_2$;

and the remainder nitrogen. Calculate the proportion by mass of carbon to hydrogen in the fuel, assuming it to be a pure hydrocarbon. *10*

4. Write short notes on : $2\frac{1}{2}\times 4 = 10$

(a) Wind energy

(b) Magnetohydrodynamics

(c) Solar thermal system

(d) Bio-gas generating system

5. (a) Explain the differences between impulse and reaction turbine. *5*

(b) Briefly explain the working principle of various types of compressors. *5*

6. In a steady flow system turbine, following data is given :

$h_1 = 3200$ kJ/kg; $C_1 = 10$ m/sec; $\dot{m} = 2$ kg/sec

$h_2 = 2800$ kJ/kg; $C_2 = 50$ m/sec; $\Delta z = 3$ m

Find :

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

(ii) the heat loss of $W_x = 780$ kJ/sec. *10*

7. (a) Describe the characteristics of coke and briquette fuels. 5

(b) What is the role of fundamental laws for stoichiometric calculation ? Explain each in brief. 5

8. Write short notes on : $2\frac{1}{2} \times 4 = 10$

(a) Isomerization

(b) Alkylation

(c) Polymerization

(d) Dehydrogenation

9. With the help of neat diagrams, describe the working of : 5+5=10

(a) Water tube boiler

(b) La-Mont boiler

10. (a) Derive the expression of efficiency for 4-stroke S.I. engine. 5

(b) Describe the working principle of electrostatic precipitator. 5