Y 5096

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

Elective

Energy Engineering

EY 040 — COGENERATION AND WASTE HEAT RECOVERY SYSTEMS

(Common to M.E. – Thermal Engineering)

(Regulation 2002)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define "Cogeneration Facility".

2. Define Topping cycle.

3. What is supplemental firing in combined cycle for cogeneration?

4. Define Regular Investment Tax Credit.

5. What are the different economic sources of waste heat?

6. What do you understand by cascading?

7. What are the basic requirements of fluid used for bottoming cycle?

8. What are the basic features of a waste heat boiler compared with conventional?

9. What are the effects of thermal pollution?

10. What are the basic radioactive pollutants?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the basic benefits of co-generation. (16)

Or

(b) Describe the project financing and ownership. (16)

12. (a) (i) Describe the working of simple cycle gas turbine generator for power generation. (8)

(ii) Discuss the supplemental firing in the steam generator furnace. (8)

Or

(b) (i) Write any two application of the cogeneration. (8)

(ii) Write a short note about performance specifications and technical comparisons of major equipment used in cogeneration. (8)

13. (a) (i) Discuss about Energy Cascading. (8)

(ii) Explain the Latent Heat Recovery. (8)

Or

(b) What do you understand by economical extraction of waste heat? How does the working fluid affects the economy of heat extraction? (16)

14. (a) A steam station in conjunction with pump – storage plant which is capable of supplying 120×10^6 kW - hr energy per year with a maximum output of 30 MW.

Find out the cost of energy per units in each of the two cases mentioned above

Use the following data :

Capital cost of steam station = Rs. 1,800/kW of installed capacity

Capital cost of pump storage plant = Rs. 1,200/kW of installed capacity

Operating cost of steam plant = 5 p/kW-hr

Operating cost of pump storage plant = 0.4 p/kW-hr

Interest and depreciation together on the capital invested should be taken as 12%. Assume that no spare capacity is required. (16)

Or

(b) Discuss the uses of waste heat in the following :

(i) Agriculture

(ii) Green house

(iii) Animal shelters

(iv) Aquacultural uses. (16)

15. (a) (i) Describe, with a neat sketch, the Heat pump systems in Waste heat applications. (10)

(ii) Discuss the uses of heat pipe in Waste heat recovery systems. (6)

Or

(b) Explain with neat sketch the heat recovery system and waste heat boiler. (16)
