C 62983 (Pages : 3) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE [SUPPLEMENTARY] EXAMINATION, APRIL 2014

(2009 Scheme)

ME/PTME 09 704—POWER PLANT ENGINEERING

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is meant by externally irreversible and internally irreversible Rankine cycle ?
2. What is meant by boiler efficiency ?
3. How does a steam turbine convert energy in steam to shaft work ?
4. What is meant by neutron life-cycle ?
5. What are the types of reactors in nuclear power generation ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Show that the regenerative feed water heating improves the cycle efficiency.
7. Explain the working of a Convective Super Heater (CSH).
8. What is the function of a steam generator ? How does an industrial steam generator differ from a utility boiler ?
9. How does energy conversion occur in a (a) impulse blade ; (b) reaction blade. What is meant by carry over efficiency ?
10. A forced circulation boiler delivering 36 kg/s at 130 bar is operated with a circulation ratio of 5 : 1. The circulation pumps impart a head rise of 2.8 bar with suction conditions of 350°C and 140 bar. What would be the ideal pump work amount to per kg of steam delivered ?
11. What are the following (a) Reserve factor ; (b) Load factor ; (c) Capacity factor ; (d) Diversity factor ; (e) form factor.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. The net power output of an ideal reheat regenerative steam cycle is 80 MW. Steam enters at h.p. turbine at 80 bar 500°C and expands till it becomes saturated vapour. Some of the steam then goes to an open feedwater heater and the balance is reheated to 400°C, after which it expands in an l.p. turbine to 0.07 bar. Compute (a) The cycle efficiency ; (b) the reheat pressure ; (c) the steam flow rate to the h.p. turbine; (d) the rate of flow of cooling water in the condenser if the temperature rise of water is 8°C ; (e) if the velocity of steam flowing from the turbine to the condenser is limited to 130 mS^{-1}, find the diameter of the connecting pipe.

(10 marks)

Or

13. (a) With a neat flow diagram, explain the working of Mercury-steam binary vapour cycle.

(8 marks)

(b) What is the difference between binary and coupled cycles. (2 marks)

14. (a) What are the major losses in steam turbines ? Explain. (8 marks)

(b) What is chocked flow ? (2 marks)

Or

15. Combustion gases expand in a propulsion nozzle from 3.8 bar and 450°C to a back pressure of 1 bar at the rate of 16 kg/s. Assuming the inlet velocity to be negligible, and taking the coefficient of discharge of 0.98 and a nozzle efficiency of 0.93, calculate the required throat and exit areas of the nozzle. For the gases take C_p= 1.11 KJ/kg K and γ = 1.333.

(10 marks)

16. (a) Explain the mechanism of heat absorption in water tube boilers. (7 marks)

(b) What is meant by forced circulation ? (3 marks)

Or

17. (a) How a convective superheater works ? (6 marks)

(b) What is a mixed flow superheater ? How it works ? (4 marks)

18. A power station supplies the following loads to the consumers :

Time in hours	0 – 6	6 – 10	10 – 12	12 – 16	16 – 20	20 – 22	22 – 24
Load in MW	30	70	90	60	100	80	60

(a) Draw the load curve and estimate the load factor of the plant ; (b) what is the load factor of a stand by equipment of 30 MW capacity if it takes up all loads above 70 MW. What is its use factor ?

(10 marks)

Or

19. Explain the working of a gas cooled reactor with the help of a schematic diagram. (10 marks)

[4 × 10 = 40 marks]