

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Question Paper Code : 10994

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2026.

Fifth/Sixth/Seventh/Eighth Semester

Mechanical Engineering

CME384 — POWER PLANT ENGINEERING

(Common to Electrical and Electronics Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Why thermal plants are not suitable for supplying fluctuating loads?
2. List the characteristics of a good ash handling plant.
3. How does regeneration improve the thermal efficiency of gas turbine cycle?
4. Mention a few characteristics of a diesel power plant.
5. List out the important components of a nuclear reactor.
6. What is meant by CANDU-type reactor?
7. Calculate the average power available for one tidal period if the surface area is $150,000 \text{ m}^2$ and the range of tide is 10.25 m.
8. A turbine develops 5 MW under a head of 20 m at 125 rpm. What is the specific speed?
9. What is the significance of two part tariff and three part tariff?
10. List down the nuclear waste disposal methods.

PART B — ($5 \times 13 = 65$ marks)

11. (a) Find the efficiency of the prime mover operating on the Rankine cycle between 7 bar and 1 bar for the following initial conditions.
- (i) The steam has a dryness fraction of 0.8
 - (ii) The steam is dry and saturated, and
 - (iii) The steam is superheated to 350°C .
- Draw T-s diagrams for each case. Neglect the pump.

Or

- (b) Draw a general layout of a thermal power plant and explain the working of different circuits.
12. (a) An engine works on an ideal dual cycle having the pressure and temperature at the beginning of the cycle at 1 bar and 90°C . The compression ratio of the cycle is 11 and the maximum pressure is limited to 49.2 bar. The heat supplied at constant pressure continues for 5% of the stroke. Find the work done per kg of air and cycle efficiency.

Or

- (b) A four-stroke diesel engine has a piston diameter of 16.5 cm and a stroke of 27 cm. The compression ratio is 14.3, the cut-off is 4.23% of the stroke and the mean effective pressure is 4.12 bar. The engine speed is 264 rev/min and the fuel consumption is 1.076 kg of oil per hour, having a calorific value of 39150 kJ/kg. Calculate the relative efficiency of the engine.
13. (a) Explain the working of a pressurised water reactor with a schematic diagram.

Or

- (b) (i) Discuss the various factors to be considered while selecting the site for a nuclear power station. (8)
- (ii) Discuss why a nuclear reactor needs a moderator material. (5)
14. (a) (i) Describe the principle of a fuel cell and discuss the choice of fuels required. (7)
- (ii) Explain the working of a continuous process biogas plant. (6)

Or

- (b) (i) Briefly explain the classification of tidal power plants with neat sketch. (7)
- (ii) Explain in detail about the various types of wind energy systems. (6)

15. (a) The yearly duration curve of a certain plant can be considered as a straight line from 400 MW to 100 MW. Power is supplied with one generating unit of 250 MW capacity and two units of 125 MW capacity each. Determine the
- (i) installed capacity
 - (ii) load factor
 - (iii) maximum demand
 - (iv) utilization factor.

Or

- (b) Discuss on pollution control and waste disposal in coal and nuclear power stations.

PART C — (1 × 15 = 15 marks)

16. (a) With a neat sketch, explain the working principle of hydroelectric power plant.

Or

- (b) The maximum demand of a power station is 80000 kW and daily load is described as follows.
- (i) Determine the load factor of power station and draw the load duration curve. (8)
 - (ii) What is the load factor of stand by equipment rated at 25 MW that takes up all the loads in excess of 60 MW? (7)

Time (hrs)	0-6	6-8	8-12	12-14	14-18	18-22	22-24
Load (MW)	40	50	60	50	70	80	40

