

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VIII MECHANICAL :SUMMER- 2022

SUBJECT : POWER PLANT ENGINEERING

Day : Tuesday
Date : 14-06-2022

S-13464-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N. B.:

- 1) **Solve** Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable **CALCULATOR** is allowed
- 4) Assume suitable data, if **NECESSARY**.

- Q.1** a) What is principle of operation of Combined Cycle Power Plant? (05)
b) What is role of NTPC and NHPC in development of power in India? (05)

OR

- Q.2** a) Compare nuclear power plant with hydroelectric power plant. (05)
b) What is principle of operation of cogeneration power plant? (05)

- Q.3** An open cycle gas turbine power plant takes air in at 1 bar and 32°C. The maximum pressure and maximum temperature of the cycle are limited to 7 bar and 1100 K respectively. The isentropic efficiencies of compressor & turbine are 84% and 85% respectively. The effectiveness of the regenerator is 0.6. Assuming the combustion efficiency 90% & neglecting the heat & pressure losses in the system, find the cycle efficiency & air-fuel ratio used. (10)

OR

- Q.4** a) What are the various steps involved in preparation of nuclear fuel? (05)
b) With the help of a nuclear reaction, estimate the amount of energy generated. Also discuss how is disposal of nuclear waste done? (05)

- Q.5** Derive the following expression for flow through a nozzle. (10)

$$\frac{dA}{A} = \frac{dP}{\rho V^2} (1 - M^2)$$

Where the symbols have their usual meanings.

Also discuss its significance with converging, diverging and converging-diverging nozzles.

OR

- Q.6** a) With the help of a neat sketch, explain the principle of operation of hyperbolic cooling tower. (05)
b) What do you understand by vacuum efficiency and condenser efficiency? (05)

P.T.O.

Q.7 A wind energy generator generates 1600W at a rated speed of 7 m/s at atmospheric pressure & temperature of 20°C. Calculate the power generated & the change in output if the wind generator is operated at an altitude of 1750 m, temperature 11°C, and wind speed 8.5 m/s and air pressure 0.9 atmosphere. **(10)**

OR

Q.8 a) What is difference between parabolic trough collector and parabolic dish reflector? **(05)**

b) What do you understand by biomass combustion? **(05)**
With the help of a neat sketch explain the steps involved in it.

Q.9 The following loads are connected to a power plant. **(10)**

Type of load	Maximum demand (MW)	Diversity factor	Demand factor
Domestic	15	1.25	0.70
Commercial	25	1.20	0.90
Industrial	50	1.30	0.98

If the overall diversity factor is 1.5, determine,

- a) The maximum demand
- b) Connected load of each type

OR

Q.10 a) What are different tariff methods for electrical energy? **(05)**
Explain any one in brief.

b) What are the fixed costs involved in cost of electrical energy? **(05)**

Q.11 a) What is principle of operation of pumped hydroelectric storage? **(05)**

b) What safety measures are to be taken during maintenance of power plants? **(05)**

OR

Q.12 a) What are the recent advancements in battery technology? **(05)**

b) What is importance of operator training from plant safety point of view? **(05)**

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