

Total No. of Questions : 8]

SEAT No. :

PE2296

[Total No. of Pages : 3

[6584]-204

B.E. (Mechanical)

ENERGY ENGINEERING

(2019 Pattern) (Semester-VIII) (402049)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right of each question indicate full marks.
- 4) Assume suitable data wherever necessary and mention the same clearly.
- 5) Use of steam tables, Mollier chart and calculator is allowed.

- Q1) a) Discuss with neat sketch Plant Layout of High Capacity Diesel Engine Power Plant. Enlist the applications of the same. [8]
- b) Draw the hydrograph and flow duration curve for the following data:[9]

Month	Inflow(m ³ /s)	Month	Inflow(m ³ /s)
Jan.	1600	July	3000
Feb.	1200	Aug.	3000
March	800	Sept.	1600
April	800	Oct.	800
May	800	Nov.	800
June	1200	Dec.	1000

Determine:

- i) Storage capacity for a constant demand of 1100 m³/s
- ii) Number of additional months this storage capacity can be utilized if there is no rain fall.

OR

- Q2) a) What do you mean by nuclear fission? Discuss in brief. Elaborate functions of following elements of nuclear reactor. [8]
- i) Coolants
 - ii) Control Rods
- b) Describe the Sodium Graphite Reactor with following points. [9]
- i) Labelled Diagram
 - ii) Construction and working
 - iii) Material for different elements of reactor
 - iv) Limitations

P.T.O.

- Q3) a)** Discuss concept of thermal efficiency and work ratio of Gas Turbine cycle. How Regeneration technique helps to improve thermal efficiency of Gas Turbine cycle? Elaborate with neat schematic and T-s diagram. [9]
- b)** The air enters the compressor of a gas-turbine power plant at 1 bar, 30 degrees Celsius and 162 tons per hour. The maximum cycle temperature, pressure is 650 degrees Celsius, 5 bar respectively. The two stage expansion with reheating pressure of 2.24 bar is used in the plant. In the reheater gas is heated up to maximum cycle temperature. The isentropic efficiency of compressor, first turbine, and second turbine is 80%, 85%, 90% respectively. Take adiabatic index for air gas as 1.4, 1.33 respectively. Take specific heat for air, gas as 1 KJ/Kg-K, 1.15 KJ/Kg-K respectively. Neglect mass flow rate of fuel. Draw cycle arrangement and T-s diagram and determine: [9]

- i) The thermal efficiency of cycle
- ii) Power output of plant in MW

OR

- Q4) a)** Elaborate the gas and steam combined cycle plant with cycle arrangement, T-s diagram, advantages and disadvantages. [9]
- b)** Explain the Integrated Gasification Combined Cycle (IGCC) plant with cycle arrangement, T-s diagram, merits and demerits. [9]

- Q5) a)** State the main functions of the relays. What are different types of the same? Discuss working of any one relay with a neat sketch. [9]
- b)** What are different methods thermal energy storage? Explain anyone with simple diagram. Discuss the principles of energy management with storage systems. [8]

OR

- Q6) a)** A hydro-electric plant costs Rs 3000 per kW of installed capacity. The total annual charges consist of 5% as interest; depreciation at 2%, operation and maintenance at 2% and insurance, rent etc. 1.5%. Determine a suitable two-part tariff if the losses in transmission and distribution are 12.5% and diversity of load is 1.25. Assume installed capacity of the station be 100 kW & maximum demand on the station is 80% of the capacity and annual load factor is 40%. What is the overall cost of generation per kWh? [9]
- b)** Discuss the performance and operating characteristics of power plant using: [8]
- i) Input-output curve
 - ii) Plant Efficiency curve
 - iii) Heat rate curve
 - iv) Incremental heat rate curve

- Q7) a)** Explain following terms in brief related to wind power systems. [9]
- i) Cut-in Speed
 - ii) Cut-out Speed
 - iii) Rated Speed
 - iv) Betz Limit
 - v) Co-efficient of power
 - vi) Blade Tip ratio
- b) Which type of turbines are used in Tidal power plants? Explain single basin and double basin tidal power plants with a neat sketch. [9]

OR

- Q8) a)** Discuss open type MHD based power generation system with following points. [9]
- i) Labelled Diagram
 - ii) Construction and working
 - iii) Advantages
 - iv) Limitations
- b) Explain Hydrogen Energy systems with following points. [9]
- i) Working principle of hydrogen production,
 - ii) Methods of hydrogen storage
 - iii) Applications

