

3 hours

80 Marks

N. B.:

1. Attempt any **FOUR** Questions.
2. Use illustrative diagrams wherever required.

- Q1)** Attempt any FOUR.
- a) What are the different types of power plants where electricity is produced in bulk quantities? Name few power plants in India. **05**
 - b) What do you understand by load factor and capacity factor? When they are numerically equal? **05**
 - c) How is the total installed capacity of SPP is decided? **05**
 - d) On what factors does the unit size of a GTPP depend? **05**
 - e) What do you understand by Combined Operation of Plants (COP)? **05**
- Q2)**
- a) Differentiate between diffusion, transition and kinetic zones of combustion. **05**
 - b) How is an SPP boiler differ from a utility boiler? **05**
 - c) How is the number of stages in steam turbine is estimated in SPP? **05**
 - d) Why is the temperature of cooling water is restricted in SPP? **05**
- Q3)**
- a) Why is power generation by gas turbines attractive these days? Give specific advantages and disadvantages of GTPP for a utility system. **10**
 - b) A simple open cycle GTPP works between 1 bar, 300 K and 6 bar, 1023 K. The CV of fuel used is 44MJ/kg. If mechanical and generator efficiencies are 0.95 and 0.96 respectively and air flow is 20kg/s, find air-fuel ratio, thermal efficiency and power output. **10**
- Q4)**
- a) How is the type of turbine selected in HePP? Discuss the effect of head, specific speed, height of installation, operating characteristics and capacity on the selection process. **10**
 - b) Show the tailrace, headrace, canal, flume, tunnel, penstock, spillway, draft tube, surge tank and turbine in the general layout of HePP. **10**
- Q5)**
- a) What are the three stages of India's nuclear power program? Discuss its progress from year 1950 to year 2015. **10**
 - b) A reactor is operating at a low power of 1W. It then becomes supercritical with effective multiplication factor (k_{eff}) as 1.0015. The average neutron life is 0.0001 s for prompt neutrons. Determine reactor power level at the end of 1 s. **10**
- Q6)**
- a) What are the various types of combined cycle plants? What are the inherent advantages of such plants? **10**
 - b) For a mercury-steam-SO₂ combined cycle heat rejected in mercury cycle is given to steam cycle and heat rejected in steam cycle is utilized in SO₂ cycle. If the efficiencies of mercury, steam and SO₂ cycles are 0.5, 0.4 and 0.25 respectively. Find the efficiency of combined cycle. **10**
