



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.
 11. Steam table & Mollier's chart are allowed.

1. In a compound gas turbine, the air from compressor passes through a heat exchanger heated by exhaust gases from low pressure turbine, then in - to high pressure combustion chamber. The high pressure turbine drives both the compressors only. The exhaust from high pressure turbine passes thro' low pressure combustion chamber to low pressure turbine which is coupled to external load. The following data referes to the plant: Draw T – S chart and determine: **13**
- a) Pressure of gases entering LP turbine.
 - b) Net specific power and Overall efficiency.
- Data given below:
- Compression ratio in compressor = 4
 Isentropic efficiency of compressor = 86%
 Isentropic efficiency of both turbine = 84%
 Mechanical efficiency to drive compressor = 92%
 Heat exchanger effectiveness = 70%
 Temperature of gases entering HP turbine = 600°C
 Temperature of gases entering LP turbine = 625°C
 Air properties: $C_{pa} = 1.005 \text{ kJ/kgk}$ & $\gamma = 1.4$
 Gas properties: $C_{pg} = 1.15 \text{ kJ/kgk}$ & $\gamma = 1.33$
 Ambient conditions = 1 bar & 15°C
- OR**
2. a) Classify Gas turbine. Explain with neat sketch constant volume gas turbine. **6**
- b) What is cogeneration? Explain with neat sketch construction and working of Gas turbine – steam turbine cogeneration plant. **7**
3. Determine the specific thrust and specific fuel consumption for a simple turbojet engine having following component performance at the design point at which the cruising speed and altitude are 270 m/s and 5 km. **14**
- Compressor pressure ratio = 8:1
 Turbine inlet temperature = 1200k
 Isentropic efficiency of compressor = 87%
 Isentropic efficiency of turbine = 90%

Isentropic efficiency of intake = 93%
Isentropic efficiency of Nozzle = 95%
Mechanical transmission efficiency = 98%
Combustion pressure loss = 4% of compressor delivery pressure
Theoretical Fuel – air ratio = 0.0174

OR

4. a) Classify Nuclear Reactor's. Explain construction & working of CANDU reactor. 7
b) What are the problems occurs in reactor's operation? How the site selection is done for Nuclear power plant. 7
5. a) What is solar constant. Explain principle of conversion of solar radiation in to heat. 6
b) Explain with neat sketch solar thermal power plant. 7

OR

6. Explain following **any three**. 13
a) Solar photovoltaic Cell b) MHD Generator
c) Flat Plate Collector d) Wind generator
7. a) What is energy audit? What are the benefits of energy audit towards industry. 6
b) Explain the procedure of energy audit. 7

OR

8. a) Enlists the instruments used in energy auditing? Explain with neat sketch portable infrared radiation thermometer. 6
b) What is Sankey diagram? How it helps to identify losses. Draw Sankey diagram for any thermal system. 7
9. a) Classify hydraulic valves. Explain with neat sketch construction and working of pilot operated pressure relief valve. 7
b) Draw and explain Fast Approach and Slow traverse Hydraulic circuit. 7

OR

10. a) Draw and explain the working of sequencing hydraulic circuit. 7
b) Draw and explain Hydraulic circuit for shaper machine. 7
11. a) Explain with neat sketch construction and working of following used in pneumatic system. 8
i) Flow control valve ii) 5/2 dcv
iii) Shuttle valve
- b) Draw & explain the pneumatic circuit for controlling speed of bi – directional air motor using 4/2 double pilot operated d.c. valve. 5

OR

12. a) Draw and explain pneumatic circuit for sequencing operation of two double acting cylinder. 7
b) What are the components of Air preparatory unit? Explain construction and working of Air Filter. 6
