M.Tech-Heat Power Engineering (Old Scheme / CBCS) Sem I

# 919 - Elective-I : Advanced Power Plant Engineering (APPE)

P. Pages : 2 **GUG/S/18/3834**

Time : Three Hours * 0 9 7 1 * Max. Marks : 70

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Notes :
1. All questions carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams and Chemical equation should be given wherever necessary.
5. Illustrate your answers wherever necessary with the help of neat sketches.
6. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.
7. Discuss the reaction, mechanism wherever necessary.
8. Answer **any five** questions.

**1.** a) What do you understand by cogeneration of power & process heat ? Explain it's thermodynamic advantages. **5**

b) Explain in detail efficiencies in a steam power plant. **5**

c) Explain the following steam cycles: **4**
i) Internally Irreversible Rankine Cycle.
ii) Externally Irreversible Rankine Cycle.

**2.** a) Explain with neat sketch Gas Turbine- Steam Turbine, Combined Cycle Power Plants. **8**

b) In a cogeneration binary cycle, superheated steam enters the turbine with a mass flow rate of 5 kg/sec at 40 bar, 440ºC & expands isentropically to 1.5bar. Half and the flow is extracted at 1.5 bar & used for industrial process heating. The remaining steam passes through a heat exchanger which serves as the boiler of the Refrigerant - 12 cycle & the condensate for the steam cycle. The condensate leaves the heat exchanger as saturated liquid at 1 bar, where it is combined with the return flow from the industrial process at 60ºC & 1 bar, before being pumped isentropically to the steam generator. **6**

The Refrigerant - 12 cycle is an ideal Rankine with refrigerant entering the turbine at 16 bar, 100ºC & saturated liquid leaving the condenser at 9 bar. Determine
i) The rate of heat transfer in the steam generator.
ii) The net power output of the binary cycle.
iii) The rate of heat transfer to the industrial process.

**3.** a) What are the fuels used for generation of system? **4**

b) Explain the following terms: **6**
i) Proximate analysis of coal.
ii) Ultimate analysis of coal.

c) What are the different methods of measuring the amount of excess air supplied **4**

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| **4.** | a) | Explain with neat sketch pulverized coal firing system? Mention its advantages & disadvantages. | **7** |
| | b) | Explain the merits & demerits of the coal-water mixture as a boiler fuel. | **4** |
| | c) | Explain the term, coal Gasification. | **3** |
| **5.** | a) | Distinguish between water tube boilers & Fire tube boilers. | **5** |
| | b) | Explain the following:<br>i) Economisers ii) Superheaters<br>iii) Reheaters | **6** |
| | c) | Explain the term circulating fluidized bed (FB) boilers. | **3** |
| **6.** | a) | Explain with neat sketch Ash handling system. | **5** |
| | b) | Explain the following term in steam generators:<br>i) Blow-down ii) Steam purity<br>iii) Feed water treatment | **6** |
| | c) | What are the uses of Fly ash? explain in detail. | **3** |
| **7.** | a) | Distinguish between PWR & BWR. | **5** |
| | b) | Explain with neat sketch CANDU reactor. | **6** |
| | c) | What do you understand by radio active decay? | **3** |
| **8.** | a) | Classify Hydroelectric power plants. Explain base load plants & peak plants in detail. | **7** |
| | b) | Explain the term governing of hydraulic turbines. | **4** |
| | c) | What do you understand by cavitation? What are its effects. | **3** |

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