B TECH
(SEM-VIII) THEORY EXAMINATION 2017-18
POWER PLANT ENGINEERING

Time: 3 Hours   *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt** *all* **questions in brief.**   **2 x 10 = 20**

   a. How load factor effect the cost per kWh?
   b. Define plant use factor.
   c. Differentiate between Overfeed & Underfeed stokers.
   d. What is the purpose of governing in steam turbine? Enlist various methods employed for governing in steam power plants.
   e. Differentiate between Wet sump and Dry sump lubrication system.
   f. Why is the maximum cycle temperature of gas turbine plant much lower than that of diesel power plant?
   g. Differentiate between chemical energy and nuclear energy.
   h. What is Thermal neutron?
   i. What is runoff?
   j. What are different types of pollution from power generation

SECTION B

2.   **Attempt any** *three* **of the following:**   **10 x 3 = 30**

   a. What do you mean by Incremental Heat Rate? Explain the principal of economic scheduling the load among the different units, of a power plant.
   b. Explain construction & working of La Mont Boiler.
   c. Discuss the essential components of the diesel power plant with neat layout.
   d. Explain site selection criterion of hydro power plant.
   e. The percentage volumetric analysis of a sample of dry flue gas is CO_2=10.0, CO=0.3, O_2=8.0 & N_2=81.7. Gravimetric percentage analysis of coal was C=79, H_2=5, O_2=3 & incombustible=13. Estimate (i) minimum mass of air required for complete combustion, (ii) mass of dry flue gases per kg of fuel and (iii) mass of excess air /kg of fuel supplied.

SECTION C

3.   **Attempt any** *one* **part of the following:**   **10 x 1 = 10**

   a) What is depreciation? Describe the sinking fund method for calculating depreciation rate of any power plant equipment.
   (b) A power station has to supply load as follows:

Time(hr)	0-6	6-12	12-14	14-18	18-24
Load(MW)	30	90	60	100	50

   (i) Draw the load curve.   (ii) Draw the load duration curve.
   (iii) Calculate the load factor.   (iv) Select suitable generating units to supply the load.
   (v) Calculate the capacity of the plant and the plant capacity factor.

4.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a) Why feed water treatment is necessary? With the help of neat diagram, explain the working of DM plant for feed water treatment.
b) Explain the working of FBC (Fluidized Bed Combustion) with neat sketch. State the advantages of FBC system over conventional system

5.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a) Why starting of diesel plant is more difficult? What different methods are employed for starting diesel engine? Which method is common and why?
b) A gas turbine power plant consists of a two stage compressor with intercooling and a single stage turbine with a regenerator. Air enters the compressor at 1 bar, 20°C. The maximum temperature of the cycle is limited to 900°C and the maximum pressure ratio is 6. The effectiveness of the regenerator is 0.7. The rate of air flow through the plant is 210 kg/s and the calorific value of fuel used is 40.8 MJ/kg. The isentropic efficiency of both the compressors is 0.82, the isentropic efficiency of the turbine 0.92, combustion efficiency is 0.95. Take for air c_p = 1.005 kJ/kgK and γ = 1.4 and for gases c_p = 1.08 kJ/kgK and γ = 1.33. Assuming perfect intercooling and neglecting pressure and heat losses, estimate (i) air-fuel ratio (ii) the cycle efficiency (iii) the power supplied by the plant.

6.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a) With the neat sketch, discuss the working principle, merit and demerit of CANDU nuclear power plant.
b) It is proposed to utilize monsoon stream by constructing a dam across it. The stream discharge during the monsoon season of 4 month is 20 m³/sec and for the remaining year, it is taken as 2.5 m³/sec.
   (i) Find the minimum capacity required for the reservoir on the upstream side of the dam.
   (ii) If the head loss in the pipe is 2 percent of the actual head and overall efficiency of the generation is 92, find the output of the generating station.
   Take the mean level of the water in the reservoir above the tail race level 90 m. Take monsoon period from June 1 to September 30 and take the year of 365 day.

7.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a) With the help of a sketch, discuss the constructional detail of a generator. Why is there a need of generator cooling?
b) With the help of a sketch, discuss the ring and bridging Bus-Bar arrangement of electrical equipment.