National Institute of Technology Allahabad
Allahabad 211004
Electrical Engineering Department

End semester Examinations for
B.Tech EE- 6th semester students: Academic year 2016-2017
Subject Name: Power Plant Engineering (EE-1607)
Time: 0930AM –1230PM Room No: FN1 (20), FN3 (25), FN-4(25), FE-16(14) Exam Date: 27-04-2017
Maximum Marks: 60 Faculty: M.Venkatesh Naik

- *Answer all the questions*
- *The marks allotted for each question is mentioned at the end of question in brackets*

1. a) Write the advantages and disadvantages of gas cooled reactor.[3]
   b) What are the requirements of a power plant supplying the peak load and which power plants are suitable for these loads. [3]

2. a) Describe the elements comes under operating expenditure of power plant.[3]
   b) How does the selection of prime mover affects the power plant economy. [3]

3. a) Which boiler uses pressurized combustion in it and describe the working principle of it clearly with block diagram.[3]
   b) Why ash is to be quenched before handling? Also write the characteristics of ash handling equipment. [3]

4. a) Define the calorific value of the fuel and give the relations for LCV&HCV.[3]
   b) Draw the equivalent circuit of fuel cell device and give the expression used to calculate the potential across SOFC terminals.[3]

5. a)Describe pulverized fuel burners.[4]
   b) Define following terms i) plant use factor ii) Shell iii) Scale iv) Diversity factor. [2]

6. a) Draw the layout of MTGS technology and role of power electronics in MTGS.[3]
   b) A generating unit of 10 MW capacity supplies the following loads:
      i) Domestic consumers with a maximum demand of 6 MW at a load factor of 20%
      ii) Small industrial load with a maximum demand of 400 kW at a load factor of 50%
      iii) Street light load with a maximum demand of 3.6 MW at 30% load factor

   Find the overall cost of energy per kWh for each type of consumer using the following data
   Capital cost of the plant =Rs 10,000 per kW and Total running cost =Rs 36, 00,000 per year
   Annual rate of interest and depreciation on capital cost =10%. [3]

7. a) Its proposed to supply a load with a maximum demand of 500 MW and load factor of 70%.Choice is to be made from a nuclear power plant , a hydraulic power plant and a steam power plant. Calculate the overall cost per kWh in case of each scheme as given below. [3]

S.No	Cost	Steam power plant	Hydro –electric power plant	Nuclear power plant .
1	Capital cost per MW installed	Rs 3 Crore	Rs 4 Crore	Rs. 5 Crore
2	Interest	6%	5%	5%
3	Depreciation	6%	4%	5%
4	Operating cost(including fuel cost)/kwh	30 paise	5 paise	15 paisse
5	Transmission and Distribution cost/ kWh	2 paise	3 paise	2 paise

b) Describe the layout of diesel engine power plant. [3]

8. a) What are the top 5 hydro power plants in our India give their location and capacity.[2]

b) Write the useful life of steam power plant components [2]

c) An industrial undertaking has a connected load of 220 kW. The maximum demand is 180 kW. On the average each machine works for 60% time. Find the yearly expenditure on electricity if the tariff is

Rs 1200 + Rs 120 per kW of maximum demand per year + Rs. 0.15 per kWh [2]

9. a) Explain double layer charge effect in fuel cell and draw the equivalent circuit of FC with it.[2]

b) Describe the type of fuel cells and mention the operating temperature and electrolyte used in each of them. [2]

c) Define DG as per i) IEEE ii) CIGRE [2]

10. a) Write the features of high pressure boilers. [2]

b) Enumerate various types of loads [2]

c) Give the cost sharing of different components used in steam power plant. [2]