Code No: **R204102O** **R20** **Set No. 1**

IV B.Tech I Semester Regular Examinations, January – 2024

CONCEPTS OF POWER SYSTEM ENGINEERING

(Common to All Branches except EEE)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1 a) Draw the schematic diagram of a thermal power plant and explain its operation. [7]

b) Discuss the merits and demerits of hydro power plants. [7]

(OR)

2 a) Explain the working of gas turbine power plants with a schematic diagram. [7]

b) Give the comparison of thermal power plant and hydro power plant on the basis of operating cost, initial cost, efficiency, maintenance cost, space required, starting and availability of source of power. [7]

UNIT - II

3 a) Discuss the various conductor materials used for overhead lines, what are their relative advantages and disadvantages. [10]

b) What is a distribution system and explain its types? [4]

(OR)

4 a) What is substation? Discuss the different ways of classifying the substation. [7]

b) Explain the differences between overhead and underground systems. [7]

UNIT - III

5 a) What is a circuit breaker? Describe its operating principle. [7]

b) Explain the desirable characteristics of fuse element. [7]

(OR)

6 a) Discuss the operation of lightning arresters with neat schematic. [7]

b) What is grounding? Write grounding advantages. [7]

Code No: **R204102O** **R20** **Set No. 1**

UNIT - IV

7 a) Why is the load on a power station variable? What are the effects of variable load on the operation of the power station? [7]

b) A generating station has a connected load of 40MW and a maximum demand of 20MW, the units generated being 60×10^6. Calculate

(i) The demand factor

(ii) The load factor. [7]

(OR)

8 a) Discuss about the flat rate tariff and block rate tariff. [7]

b) Explain the following:

i) Load duration curve

ii) Utilization factor

iii) Load factor

iv) Demand factor. [7]

UNIT - V

9 a) Discuss the disadvantages of a low power factor. [7]

b) Explain about the shunt capacitor compensation with neat sketch. [7]

(OR)

10 a) How do you increase or decrease power factor? What are the benefits of power factor improvement? [7]

b) A 3-phase, 5kW induction motor has a p.f. of 0.7 lagging. A bank of capacitors is connected in delta across the supply terminals and p.f. raised to 0.92 lagging. Determine the kVAR rating of the capacitors connected in each phase. [7]

Code No: **R204102O** **R20** **Set No. 2**

IV B.Tech I Semester Regular Examinations, January – 2024

CONCEPTS OF POWER SYSTEM ENGINEERING

(Common to All Branches except EEE)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
*****

UNIT - I

1 a) Draw a neat schematic diagram of a hydro power plant and explain the functions of various components. [7]

b) Explain with a neat sketch the various parts of a nuclear reactor. [7]

(OR)

2 a) Discuss the merits and demerits of thermal power plants. [7]

b) Give the comparison of nuclear power plant and gas power plant on the basis of operating cost, initial cost, efficiency, maintenance cost, space required, starting and availability of source of power. [7]

UNIT - II

3 a) What are the line constants of a transmission line? [4]

b) A single phase overhead transmission line delivers 1100kW at 33kV at 0.8 p.f. lagging. The total resistance and inductive reactance of the line are 10Ω and 15Ω respectively. Determine

(i) Sending end voltage
(ii) Sending end power factor
(iii) Transmission efficiency. [10]

(OR)

4 a) What is the purpose of an overhead transmission line? How are these lines classified? [7]

b) What is the justification in neglecting line capacitance in short transmission lines? [7]

UNIT - III

5 a) What is a fuse? Discuss the advantages and disadvantages of a fuse. [7]

b) Comparison between SF_6 circuit breaker and vacuum circuit breaker. [7]

(OR)

Code No: **R204102O** **R20** **Set No. 2**

6 a) What are the methods of neutral grounding? Explain about the resistance grounding. [7]

b) List out the advantages and disadvantages of SF_6 circuit breaker. [7]

UNIT - IV

7 a) What do you understand by the load curve? What information are conveyed by a load curve? [7]

b) A generating station has the following daily load cycle

Time (Hrs)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	40	50	60	50	70	40

Draw the load curve and find (i) maximum demand (ii) Average load (iii) Load factor. [7]

(OR)

8 a) What do you understand by tariff? Discuss the objectives of tariff. [7]

b) What are the various types of tariff? Explain any two of them. [7]

UNIT - V

9 a) Explain the causes of low power factor of the supply systems. [7]

b) Discuss about the series capacitor compensation with neat sketch. [7]

(OR)

10 a) What are the various types of voltage regulating devices? Explain any one of them. [7]

b) A single phase motor connected to a 240V, 50Hz supply takes 20A at a power factor of 0.75 lagging. A capacitor is shunted across the motor terminals to improve the p.f to 0.9. Determine the capacitance of the capacitor to be used. [7]

Code No: **R204102O** **R20** **Set No. 3**

IV B.Tech I Semester Regular Examinations, January – 2024

CONCEPTS OF POWER SYSTEM ENGINEERING

(Common to All Branches except EEE)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

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UNIT - I

1 a) Explain the important components of thermal power plants. [7]
b) Discuss the merits and demerits of a nuclear power plants. [7]

(OR)

2 a) Draw a neat schematic diagram of a nuclear power plant and explain the functions of various components. [7]
b) Explain the following functions of the hydro power plant
(i) Dam (ii) Spillways (iii) Surge tank (iv) Draft tube. [7]

UNIT - II

3 a) What are the three classifications of transmission lines? What is the main reason for using a short transmission line? [7]
b) Evaluate the generalised circuit constants for short transmission line. [7]

(OR)

4 a) Explain the structure of cable with neat sketch. [5]
b) An overhead 3-phase transmission line delivers 5000kW at 22kV at 0.8p.f. lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively. Determine
(i) Sending end voltage (ii) Percentage regulation (iii) Transmission efficiency. [9]

UNIT - III

5 a) Explain the construction and working principle of SF_6 circuit breaker with neat sketch. [7]
b) Discuss the function of the following (i) Fuse (ii) Relays (iii) Circuit breaker. [7]

(OR)

6 a) Discuss about the reactance and resonant grounding. [7]
b) What are the types of faults in a power system? Explain. [7]

Code No: **R204102O** **R20** **Set No. 3**

UNIT - IV

7 a) Define and explain the importance of the following terms in generation
(i) Connected load (ii) Maximum demand
(iii) Demand factor (iv) Average load. [7]

b) A generating station has a connected load of 43MW and a maximum demand of 20MW, the units generated being 61.5×10^6 per annum. Calculate
(i) The demand factor (ii) Load factor. [7]

(OR)

8 a) What is the importance of load factor? Explain load duration curve. [7]

b) Give the basis for expressing the cost of electrical energy as $a + bkW + ckWh$ and explain the factors on which 'a', 'b' and 'c' depend. [7]

UNIT - V

9 a) Why capacitor is used for power factor improvement? How can power factor be improved by shunt capacitor compensation? [7]

b) What is power factor and how it works? What are the effects of a low power factor? [7]

(OR)

10 a) Discuss the importance of voltage control in the modern power system. [7]

b) A 3-phase, 5kW induction motor has a p.f. of 0.75 lagging. A bank of capacitors is connected in delta across the supply terminals and p.f. raised to 0.9 lagging. Determine the kVAR rating of the capacitors connected in each phase. [7]

Code No: **R204102O** **R20** **Set No. 4**

IV B.Tech I Semester Regular Examinations, January – 2024

CONCEPTS OF POWER SYSTEM ENGINEERING

(Common to All Branches except EEE)

Time: 3 hours **Max. Marks: 70**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks

*****

UNIT - I

1 a) Draw a neat schematic diagram of a gas power plant and explain the functions of various components. [7]

b) Give the comparison of hydro power plant and gas power plants. [7]

(OR)

2 a) Discuss the merits and demerits of gas power plants. [7]

b) Explain the following functions of the thermal power plant
(i) Coal and ash handling arrangement (ii) Steam turbine
(iii) Feed water (iv) Cooling arrangement. [7]

UNIT - II

3 a) Classify and explain overhead transmission line. [7]

b) What do you understand by generalised circuit constants of a transmission line? What is their importance? [7]

(OR)

4 a) What are the schemes of electrical distribution system? Explain. [7]

b) What is the maximum length in km for a 1-phase transmission line having copper conductor of 0.775cm^2 cross-section over which 200kW at unity power factor and at 3300V are to be delivered? The efficiency of transmission is 90%, take specific resistance as 1.725μΩ cm. [7]

UNIT - III

5 a) Explain the construction and working principle of Vacuum circuit breaker with neat sketch. [7]

b) What is resonant earthing? What are the advantages of resonant grounding? [7]

(OR)

6 a) Compare resistance and reactance grounding. [7]

b) Enumerate the advantages and applications of vacuum circuit breaker. [7]

Code No: **R204102O** **R20** **Set No. 4**

UNIT - IV

7 a) Explain the term load factor and how do these factors influence the cost of generation. [7]

b) A generating station has the following daily load cycle

Time (Hrs)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	20	25	30	25	35	20

Draw the load curve and find (i) Maximum demand (ii) Average load (iii) Load factor. [7]

(OR)

8 a) Discuss how load curves help in the selection of size and number of generating units. [7]

b) Explain the different classifications of costs of electrical energy. [7]

UNIT - V

9 a) What are the causes and disadvantages of low power factor? [5]

b) Why capacitor is used for power factor improvement? How can power factor be improved by series capacitor compensation? [9]

(OR)

10 a) What are the advantages of voltage control in power system? [7]

b) A 3-phase, 3kW induction motor has a p.f. of 0.7 lagging. A bank of capacitors is connected in delta across the supply terminals and p.f. raised to 0.95 lagging. Determine the kVAR rating of the capacitors connected in each phase. [7]