Code No: 07A40201 **R07** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
POWER SYSTEMS - I
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A generating station has a maximum demand of 15 MW and the daily load on the station is as follows:

10 P.M. to 5 A.M.	2500 kW	1 P.M. to 4 P.M.	10,000 kW
5 A.M. to 7 A.M.	3000 kW	4 P.M. to 6 P.M.	12,000 kW
7 A.M. to 11A.M	9000 kW	6 P.M. to 8 P.M.	15,000 kW
11 A.M. to 1 P.M.	6000 kW	8 P.M. to 10 P.M.	5,000 kW

Determine the size and number of generator units, plant load factor, plant capacity factor and use factor of the plant. [16]

2. Short notes on
   (a) When indoor substation is preferred over outdoor substation?
   (b) Maintenance of gas insulated substation.
   (c) Advantages of sectionalized single bus bar scheme. [5+6+5]

3. (a) With a schematic diagram, explain the operation of steam power station.
   (b) Discuss the factors to be taken into consideration for selection of site for thermal station. [8+8]

4. A single phase line (ABC) of length 2 Km having resistance and reactance (go and return) as 0.06 and 0.1 ohms/km. A is the feeding point, B is the mid point of the line taking a load of 100 A at 0.9 p.f lead and C is the far end taking a load of 120 A at UPF. The Voltage at the C is 230 V. Find the voltage at the sending end and the phase angle difference between the voltages of two ends, if:
   (a) Power factors of the loads are with reference to far end voltage.
   (b) Power factors of the loads are with reference to the voltages at the load points. [8+8]

5. A 3 - phase, 5 kW, induction motor has a power factor of 0.75 lagging. A capacitor is connected across the supply terminals to raise the power factor to 0.9 lagging. Determine kVAR rating. [16]

6. (a) Define nuclear fission. Explain the phenomenon of chain reaction in nuclear power plant.
   (b) Explain the construction aspects of Gas Insulated substations. [8+8]

7. A single phase AC distributor 1 km long has resistance and reactance per conductor of 0.1 ohm and 0.15 ohm respectively. At the far end, the voltage $V_B = 200$ volts and the current is 100 A at the power factor of 0.8 (lagging). At the midpoint M of the distributor, a current of 100 A is tapped at a power factor 0.6 lagging with reference to the voltage V_M at the midpoint. Calculate

   (a) Voltage at midpoint

   (b) Sending end voltage V_A

   (c) Phase angle between V_A and V_B . [16]

8. A central station is supplying energy to a community through two substations. Each substation feeds 4 feeders. The maximum daily recorded demands are:
   POWER STATION ..... 12,000 kW

Sub - station A	.....	6000 kW	Sub - station B	.....	9000 kW
Feeder 1	.....	1700 kW	Feeder 1	.....	2820 kW
Feeder 2	.....	1800 kW	Feeder 2	.....	1500 kW
Feeder 3	.....	2800 kW	Feeder 3	.....	4000 kW
Feeder 4	.....	600 kW	Feeder 4	.....	2900 kW

   Calculate the diversity factor between

   (a) sub - stations

   (b) feeders on sub - station A and

   (c) feeders on sub - station B. [6+5+5]

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Code No: 07A40201 **R07** **Set No. 4**

II B.Tech II Semester Examinations,December 2010
POWER SYSTEMS - I
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) Explain power generation using gas turbine.
   (b) What is a Nuclear Reactor? Explain the basic components of Nuclear Reactor. [8+8]

2. Compare and explain the role of shunt and series capacitors in power factor correction. [16]

3. (a) Draw single line diagram of a gas insulated substation indicating different equipments.
   (b) What is a bus bar? Briefly explain different types of bus bar arrangements. [9+7]

4. (a) What are the different types of chimneys and discuss each type in thermal plants?
   (b) Explain super heating. [8+8]

5. (a) An 800m distributor fed from both ends A and B is loaded uniformly at the rate of 1.2A/m run, the resistance of each conductor being 0.05 ohm per/km. Determine the minimum voltage and the point where it occurs if feeding points A and B are maintained at 255 V and 250 V respectively. Find also the current supplied from feeding point A and B.
   (b) What are the advantages of a doubly fed distributor over single fed distributor? [8+8]

6. What is the importance of interest on capital investment in calculating the cost of electrical energy? [16]

7. (a) Draw the layout of a typical 11KV/400V Indoor substation and explain the equipments in detail.
   (b) Explain the following with neat diagrams:
      i. AC 3-phase, 3 wire distribution system
      ii. AC 3-phase, 4 wire system. [16]

8. The annual load duration curve of a certain power station can be considered as a straight line from 20MW to 4MW. To meet this load, three turbine - generator units, two rated at 10 MW each and one rated at 5MW are installed. Determine
   (a) Installed capacity

(b) Plant factor

(c) Units generated per annum

(d) Load factor and

(e) Utilization factor. [4+3+3+3+3]

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Code No: 07A40201 **R07** **Set No. 1**

II B.Tech II Semester Examinations,December 2010
POWER SYSTEMS - I
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. A consumer is supplied electricity at the following tariff: Rs. 70 per kVA of his maximum demand plus 5 paise per unit consumed. The consumer has an aggregate motor load of 250kW at the power factor of 0.8 lag. Calculate the consumer annual bill for a load factor of 100%. [16]

2. (a) What are the advantages of 3-wire distribution over 2-wire distribution?
   (b) Explain differences between AC and DC distribution. [8+8]

3. A generating station has a connected load of 43MW and a maximum demand of 20 MW; the units generated being $61.5*10^6$ per annum. Calculate
   (a) the demand factor and
   (b) load factor [8+8]

4. Define the terms:
   (a) Discuss various factors which affect the selection of site for a Nuclear power plant.
   (b) What is the need for nuclear power generation? [8+8]

5. A 1-phase distributor has a total resistance of 0.3 ohm at the mid point (A), a current of 100 A at 0.6 p.f lagging at the far end (B) a current of 100A at 0.8 p.f lagging is tapped. If the voltage at the far end is 200V:
   (a) Find the voltage at the supply end
   (b) Its phase angle w.r.t voltage at far end when:
      i. The p.f's are w.r.t respective voltages at the load points
      ii. The p.f's are w.r.t voltages at the far end. [6+10]

6. A 37.3 kW induction motor has power factor 0.9 and efficiency 0.9 at full load, power factor 0.6 and efficiency 0.7 at half-load. At no - load, the current is 25% of the full load current and power factor 0.1. Capacitors are supplied to make the line power factor 0.8 at half - load. With these capacitors in circuit, find the line power factor at
   (a) full load and
   (b) no - load [16]

7. (a) Discuss the difference between Kaplan, Francis and Pelton turbines and state the type of power plants they are suitable for.

   (b) Write short notes on:

   i. Draft-tube

   ii. Cavitation

   iii. Water Hammer. [8+8]

8. (a) Explain an indoor substation layout by drawing key diagram showing all equipment.

   (b) Draw single line diagram of gas insulated substation indicating different equipment. [9+7]

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Code No: 07A40201 **R07** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
POWER SYSTEMS - I
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. (a) What are the various electrical quantities measured and monitored in a sub-station?
   (b) Write short notes on accessories of a gas insulated substation. [7+9]
2. (a) Name the different nuclear materials. Explain each of them with examples.
   (b) What are the different merits and demerits of nuclear power plant? [8+8]
3. (a) Indicate the advantages of using Ring Main Systems.
   (b) State and prove Kelvins law. What are the limitations of this law? [8+8]
4. (a) Explain the method of voltage drop calculations in A,C distributor.
   (b) Draw the phasor diagrams of A.C. distributor with concentrated loads for power factors with respect to respective load points. [8+8]
5. A particular area can be supplied either by hydro station or steam station. The following data is available:-

	Hydro	Steam
Capital cost / kW	Rs. 2100	Rs. 1200
Running cost / kWh	3.2 paise	5 paise
Interest and depreciation	7.5 %	9 %
Reserve capacity	33 %	25 %

   (a) At what load factor would the overall cost be the same in both cases?
   (b) What would be the cost of generating $40*10^6$ units at this load factor? [9+7]
6. (a) What is the effect of series capacitor over voltage control?
   (b) Explain line drop compensation. [8+8]
7. Load factor for the station is 80%. The generator efficiency may be taken as 97% and the thermal efficiency of the turbines as 28%, the boiler efficiency as 77% and the overall thermal efficiency of the whole station as 20.5%.

   Choose the main equipment for the station. Find the size of each generator, turbine and boiler used. Give the main specification. [16]
8. The yearly load duration curve of a certain power station can be approximated as a straight line; the maximum and minimum loads are being 80 MW and 40MW respectively. To meet this load three turbine - generator units, two rated at 20 MW at each and one at 10 MW are installed. Determine

(a) Installed capacity
(b) Plant factor
(c) kWh output per year
(d) Load factor [4+4+4+4]

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