$\boxed{\textbf{Set No. 1}}$

II B.Tech II Semester Regular Examinations, Apr/May 2007
POWER SYSTEMS-I
(Electrical & Electronic Engineering)

Time: 3 hours   Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. Draw the one line diagram of a thermal station indicating the various circuits and also briefly discuss the main components of station. [16]

2. (a) What are the advantages of a gas turbine plant?

   (b) Describe briefly a gas turbine plant. [6+10]

3. (a) What is ring distributor? How many types of ring distributors are there? What are the advantages of providing inter connector in the ring distributor.

   (b) A 2-wire DC distributor 200m long is uniformly loaded with 2A/m. Resistance of single wire is $0.3\Omega/$ Km. If the distributor is fed at one end, calculate:

      i. the voltage drop upto a distance of 150m from the feeding point
      ii. the maximum voltage drop. [8+8]

4. A 3-phase distribution system is shown in figure 4 Power is supplied at A at line voltage of 6.6 kV and balanced loads of 25A per phase at 0.8 lagging p.f and 35A per phase at 0.9 lagging p.f are taken at B and C respectively. The impedances of the feeders are AB = (5 + j9) Ω, BC = (6 + j10)Ω and CA = (4 + j8) Ω. Calculate the voltage at B and C and the current in each branch p.f.'s are assumed w.r. to voltage at A. [16]
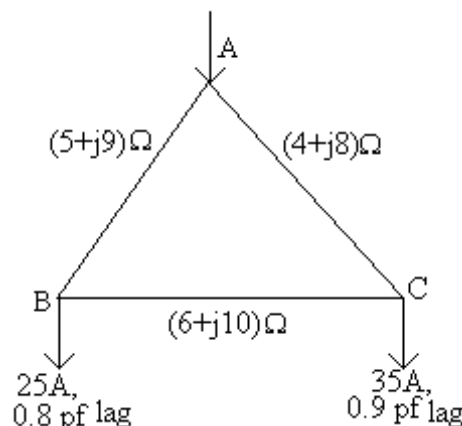

Figure 4

5. (a) Explain the main and transfer bus bar system with circuit diagram.

   (b) What is the difference between single bus bar with and without sectionalization arrangement? [8+8]

6. (a) What is the effect of low power factor in a system?

(b) A 3 phase, 50 Hz, 400 V motor develops 100 H.P., the p.f. being 0.75 lag and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and p.f. is raised to 0.95 lag. Each of the capacitance units is built of 4 similar 100 V capacitors. Determine the capacitance of each capacitor.

[8+8]

7. (a) Explain clearly how a good load factor and a good diversity factor help to keep overall cost of generation low.

(b) The peak load on a 50MW power station is 39 MW. It supplies power through for transformers whose connected loads are 17, 12, 9 and 10 MW. The maximum demands on these transformers are 15, 10 8 and 9 MW respectively. If the annual load factor is 50% and the plant is operating for 65% of the period in the year, find out

   i. average load on the station

   ii. energy supplied per year

   iii. demand factor

   iv. diversity factor and

   v. use factor for the power station. [8+8]

8. (a) What is the difference between flat rate tariff and block rate tariff.

(b) Obtain a two part tariff for the consumers of a supply undertaking which generates 390×10^6 KWh per annum and has a maximum demand of 130MW connected to it. The cost is distributed as follows:
Fuel Rs. 5×10^6, generation Rs. 2.4×10^6, transmission Rs. 5×10^6 and distribution Rs. 3.4×10^6, of these items 90%, 10%, 5% and 7% respectively are allocated to running costs, the remainder being a fixed charge. The total loss between the station and the consumers is 10% of the generated energy. If the load factor of the station is raised to 40% for the same maximum demand, find the percentage saving in the overall cost per KWh. [8+8]

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Set No. 2

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POWER SYSTEMS-I
(Electrical & Electronic Engineering)

Time: 3 hours
Max Marks: 80

Answer any FIVE Questions
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1. Draw a general layout of a modern thermal power plant and explain the working of different circuits. [16]

2. What is a nuclear reactor? Explain in details the basic components of nuclear reactor. [16]

3. (a) What is the purpose of inter connection in a DC ring main distributor.

   (b) A two wire cable distributor is loaded as shown in figure 3b. Determine the cross section of the conductor for a minimum consumers voltage of 220V.[8+8]
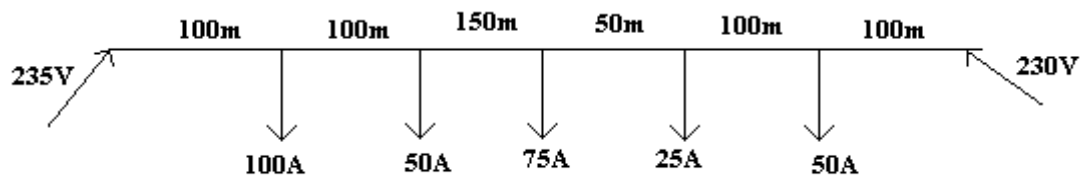

Figure 3b

4. (a) What are the factors to be considered during the voltage drop calculation of an AC distributor?

   (b) A two-wire distributor 1200m long is loaded as shown in figure 4b. The power factors at the two load points refer to the voltage at R. The impedance of each line is $(0.15 + j\,0.2)\Omega$. Calculate the sending end voltage, current and power factor. The voltage at point R is 230V. [8+8]
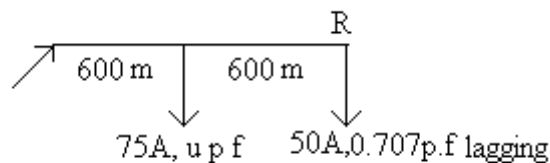

Figure 4b

5. (a) Explain the main and transfer bus bar system with circuit diagram.

   (b) What is the difference between single bus bar with and without sectionalization arrangement? [8+8]

6. (a) Explain the method of improving power factor by the method of using phase advancers.

(b) A single circuit 3-phase, 220kV line runs at no load, voltage at the receiving end of the line is 210kV. Find the sending end voltage, if the line has resistance 20.5ohms, reactance of 81.3 ohms and the total succeptance as 5.45×10^{-6}mho.The transmission line is to be represented by π-model. [8+8]

7. (a) Define the following:

    i. Connected load

    ii. maximum demand

    iii. demand factor.

(b) A power supply is having the following loads.

Type of load	Max.demand(KW)	Diversity of group	Demand factor
Domestic	15,000	1.25	0.7
Commercial	25,000	1.2	0.9
Industrial	50,000	1.3	0.98

If the overall system diversity factor is 1.5, determine

    i. the maximum demand

    ii. connected load of each type. [8+8]

8. (a) Explain with examples :

    i. Flat rate tariff

    ii. Block rate tariff

    iii. Two part tariff

    iv. power factor tariff.

(b) A 125 kVA transformer with a copper loss of 1.4 kW at full load an iron loss of 1.2 kW has the following operating schedule per year.
Full load at 0.8 p.f. for 2,000 hrs
Half - full load at 0.8. p.f. for 2,500 hrs
No-load for the remaining hours.
Find the total annual electricity bill if the flat rate tariff is 60 paise / kWh. [8+8]

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Set No. 3

II B.Tech II Semester Regular Examinations, Apr/May 2007
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(Electrical & Electronic Engineering)

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1. Draw the complete schematic diagram of a coal fired thermal power plant. Label each component. Discuss briefly the function of each component.   [16]

2. What are the types of radiation hazards and clearly explain each type.   [16]

3. (a) What are the important requirement for a good distribution system.

   (b) A distributor is fed at both ends at same voltage of 250V. The total length of the feeder is 250m and the loads the tapped off as follows: 60A at 50m from X, 50A at 80m from X, 40A at 120m from X and 30A of 160m from X. Find out

      i. the point of minimum potential
      ii. the current in each section and
      iii. the voltage at minimum potential. The resistance per Km of the conductor for go and return is 0.9Ω.   [6+10]

4. (a) How does AC distribution differ from DC distribution?

   (b) A single phase distributor PQR fed at P is as shown in Figure 4b. The power factors are lagging and expressed relative to the voltage at the far end. The impedances between the sections PQ and QR is (0.1 + j 0.15) Ω. If the voltage at the far end is 230 V, calculate the voltage at the supply end and also its phase angle with respect to the far end.   [6+10]
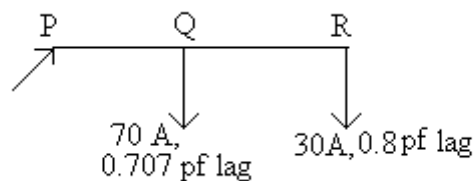

Figure 4b

5. (a) Briefly discuss the installation and maintenance of gas insulated substations.

   (b) Explain the single phase GIS with circuit diagram.   [8+8]

6. (a) Explain one method of voltage control in detail giving a neat connection diagram

   (b) A consumer has an average demand of 400 kW at a p.f of 0.8 lagging and annual load factor of 50%. The tariff is Rs.50 per kVA of maximum demand per annum plus 5 paise per kWh. If the power factor is improved to 0.95 lagging by installing phase advancing equipment, calculate

i. the capacity of phase advancing equipment,

ii. the annual saving effected. The phase advancing equipment costs Rs. 100 per kVAr and the annual interest and depreciation together amount to 10%. [8+8]

7. (a) Define the following:

   i. Connected load

   ii. maximum demand

   iii. demand factor.

(b) A power supply is having the following loads.

Type of load	Max.demand(KW)	Diversity of group	Demand factor
Domestic	15,000	1.25	0.7
Commercial	25,000	1.2	0.9
Industrial	50,000	1.3	0.98

If the overall system diversity factor is 1.5, determine

   i. the maximum demand

   ii. connected load of each type. [8+8]

8. (a) What is tariff? Discuss and compare various tariffs used in practice. Also, explain the reasons why power factor tariff is imposed.

(b) A generating station has the following data:
Installed capacity =300 MW, capacity factor =50%, Annual load factor =60%. Annual cost of fuel, oil etc. = Rs. 9×10^7, capital cost = Rs. 10^9, annual interest and depreciation 10%. Calculate

   i. the minimum reserve capacity of the station and

   ii. the cost per KWh generated. [8+8]

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$$\boxed{\textbf{Set No. 4}}$$

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Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
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1. Draw the complete schematic diagram of a coal fired thermal power plant. Label each component. Discuss briefly the function of each component. [16]

2. (a) Describe the fast breeder reactor.

   (b) Briefly discuss the types of radiations. [10+6]

3. (a) Describe briefly the different types of DC distribution

   (b) A 2-core cable distributor is loaded as shown in figure 3b The cross section of each conductor is 0.6 cm^2. Determine the currents fed at each end and the voltage at the load points. [8+8]
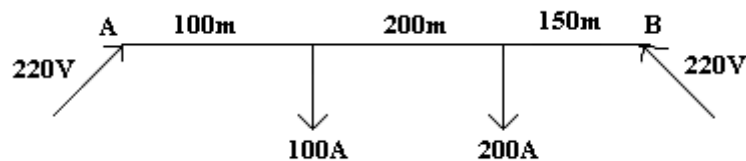

Figure 3b

4. A three-phase distribution system power is supplied at 11 kV (line voltage) and balanced load of 50 A/phase at 0.8 lagging p.f and 70 A at 0.9 lagging p.f are taken at Q and R respectively. The impedance of the feeders are PQ = (5+j9)Ω, QR = (6+j10) Ω and RP = (4+j8)Ω. Calculate the voltage at Q and R and the current in each branch. Power factors are assumed with respect to voltage at P. [16]

5. (a) Explain the main and transfer bus bar system with circuit diagram.

   (b) What is the difference between single bus bar with and without sectionalization arrangement? [8+8]

6. (a) State whether the tap changes in transformer is provided on HV side or LV side? Explain the reason for its location and elaborate how lowering or raising the output voltage is actually done.

   (b) It is provided to control the voltage of a 3-phase, 3.3 MVA feeder varying between 3 KV and 3.5 KV about 3.3 KV. Determine the minimum turn ratio of the regulator. Find also its rating. [8+8]

7. (a) What are the uses of integrated load duration curve?

(b) An industrial organization takes a steady load of 2 MW at a p.f. of 0.75 lagging and pays Rs. 125 per annum per KVA of maximum demand. Determine the capacity of the phase advancing equipment required for minimum overall annual expenditure if the phase advancing equipment costs Rs. 200 per KVAr. An interest and depreciation charge on phase advancing equipment is 10%. Also, determine the new p.f. of the supply. [6+10]

8. (a) What are the factors to be considered in fixing up the tariff.

(b) An industrial consumer having a maximum demand of 100 KW, maintain a load factor of 60%. The tariff rates are Rs. 900 per KVA of maximum demand per annum plus Rs. 1.8 per KWh of energy consumed. If the average p.f is 0.8 lagging, calculate the total energy consumed per annum and the annual electricity bill. Also workout the overall cost per KWh consumed. [8+8]

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