

II B.Tech II Semester Supplementary Examinations, Apr/May 2008
POWER SYSTEMS-I

(Electrical & Electronic Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Mention the different sources of Energy in India. [8]
(b) What are the merits and demerits of Hydro-Electric power plants? [8]
2. (a) What is the use of an electron precipitator along with the modern boilers? Explain its working. [8]
(b) What is 'feed water'? What are the problems due to impurities in feed water? How they can be eliminated? [8]
3. What is the function of a moderator? What are the desirable properties of a moderator? Compare the performance of various materials used as moderator in a nuclear reactor. [16]
4. Explain the following with neat diagrams: [8+8=16]
(a) AC 3 phase 3 wire distribution system
(b) AC 3 phase 4 wire system
5. (a) What is a sub-station? Name the factors that should be taken care of while designing and erecting a sub-station? [8]
(b) Compare the indoor and outdoor sub-stations [8]
6. (a) Discuss the important points to be taken into consideration while selecting the size and number of units. [8]
(b) Give the basis for expressing the cost of electrical energy as $(a + b \cdot \text{kW} + c \cdot \text{kWh})$ and explain the factors on which a, b and c depend. [8]
7. (a) Distinguish between a.c. and d.c. resistance of a conductor. Why the two differ? Explain fully. [6]
(b) Show that the inductance per loop meter of two-wire transmission line using solid round conductors is given by
$$L = 4 \times 10^{-7} \log_e \frac{D}{r'} \text{ henries}$$

Where D is the distance between the conductors and r' is the G.M.R. of the conductors. [10]
8. (a) Derive from first principles the capacitance per km to neutral of a 3-phase overhead transmission line with unsymmetrical spacing of conductors assuming transposition. [10]

- (b) A single phase overhead line 32km long consists of two parallel conductors each 1 cm diameter, 3 meters apart. If the line voltage be 25kV at 50HZ, determine the charging current with the line open circuited. [6]

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1. (a) Mention the different sources of Energy in India. [8]
(b) What are the merits and demerits of Hydro-Electric power plants? [8]
2. What are the systems used for firing the boilers? Explain by giving sketches. Also mention the advantages and disadvantages of pulverizing the fuel used in boilers? [16]
3. Write the short note on: [4×4=16]
 - (a) Moderators
 - (b) Control rods
 - (c) Reflectors
 - (d) Coolants.
4. A single phase line (ABC) of length 2.0 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 0.8 lead and C is the far end taking a load of 100A at Upf. The voltage at the 'C' is 220V. Find the voltage at the sending and the phase angle difference between the voltages of two ends. If [8+8=16]
 - (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.
5. (a) List out the differences between sectionalized single bus bar and sectionalized double bus bar. [8]
(b) What is group switching? Explain its operation in detail with a help of suitable diagram. [8]
6. (a) Define the following terms in connection with power supply systems: [8]
 - i. Connected load,
 - ii. Maximum demand,
 - iii. Demand factor and
 - iv. Load factor
(b) Describe some of the important types of tariff commonly used. [8]
7. (a) A conductor is composed of several identical strands, each having radius r . Find the factor by which ' r ' should be multiplied to find self G.M.D of the conductor. [8]

- (b) Find the inductance of a single phase overhead line 10km long. The line has 2 conductors each of 1.5cm diameter and spaced 2 meters apart. Calculate the reactance of the loop of both the conductors at 50 Hz. [8]
8. (a) A 3 phase 50km long single circuit 66Kv, 50 Hz transposed overhead line has horizontal spacing with 3 meters between adjacent conductors and 6 meters between outer conductor. The conductor diameter is 2 cm. Find the capacitive admittance and the charging current per phase when the line is energized at 66 KV. [8]
- (b) Explain the method of images for finding the capacitance of transmission line with ground. [8]

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1. (a) Mention the different sources of Energy in India. [8]
(b) What are the merits and demerits of Hydro-Electric power plants? [8]
2. Describe the schematic arrangement of a thermal power station and explain the function of each briefly. [16]
3. (a) Define Half life period. Derive the expression for half life period. Mention the significance of it. [10]
(b) Discuss various factors which affect the selection of site for a nuclear power plant. [6]
4. (a) State and explain Kelvin's law for most economic size of conductor for transmission. [6]
(b) A 2 wire feeder carries a constant current of 250 A throughout the year. The portion of capital cost which is proportional to area of cross section is Rs.5/- per Kg of copper conductor. The interest and depreciation total 10% per annum and the cost of energy is 5 paise per KWh. Find the most economical area of cross section of the conductor. Given that the density of copper is 8.93 gm / cm³ and its specific resistance is 1.73 X 10⁻⁸ ohm-metre. [10]
5. (a) List out the differences between sectionalized single bus bar and sectionalized double bus bar. [8]
(b) What is group switching? Explain its operation in detail with a help of suitable diagram. [8]
6. (a) Explain how a load duration curve is plotted . What is its use? [8]
(b) Discuss the different classifications of costs of electrical energy. [8]
7. The three conductors of a 3-phase line are arranged in a horizontal plane and 4 meters apart. The diameter of each conductor is 2 cm. Determine the inductance per km of each line. What will be inductance per km of each line if the lines are transposed? Why it is necessary to transpose lines? [16]
8. (a) A 3 phase 50km long single circuit 66Kv, 50 Hz transposed overhead line has horizontal spacing with 3 meters between adjacent conductors and 6 meters between outer conductor. The conductor diameter is 2 cm. Find the capacitive admittance and the charging current per phase when the line is energized at 66 KV. [8]

- (b) Explain the method of images for finding the capacitance of transmission line with ground. [8]

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1. A Hydro electric plant has a reservoir of area 2 Km^2 and of capacity 5 million cubic meters. The net head of water at the turbine is 50 m. If the efficiencies of turbine and generator are 85% and 95% respectively, calculate the total energy in kwh that can be generated from this station. If a load of 15000 kw has been supplied for 4 hours, find the fall in reservoir. [16]
2. Describe the schematic arrangement of a thermal power station and explain the function of each briefly. [16]
3. What are the main parts of a reactor? Explain the function of each component. [16]
4. (a) Explain differences between AC distribution and DC distribution. [6]
(b) 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 a power factor of 0.8 (lagging). At the mid point 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 mid point. Calculate
 - i. Voltage at mid point.
 - ii. Sending end voltage V_A .
 - iii. Phase angle between V_A and V_B . [10]
5. (a) Explain the classification of sub-stations. [8]
(b) Explain the advantages of outdoor sub-station as compared to the indoor sub-station [8]
6. (a) Define and explain the importance of the following terms in generations. [4×2=8]
 - i. connected load,
 - ii. maximum demand,
 - iii. demand factor and
 - iv. average load.
(b) Discuss the various methods of determining the depreciation of the equipment. [8]
7. (a) Explain briefly the 'skin effect' in a transmission line. On what factors does it depend? [6]

- (b) A single-phase line has conductors 2.0cm in diameter spaced 3 metre apart. Calculate the inductance per km of the loop if the material of the conductor is [10]
- i. copper and
 - ii. steel of relative permeability 50
8. (a) Derive from first principles the capacitance per km to neutral of a 3-phase overhead transmission line with unsymmetrical spacing of conductors assuming transposition. [10]
- (b) A single phase overhead line 32km long consists of two parallel conductors each 1 cm diameter, 3 meters apart. If the line voltage be 25kV at 50HZ, determine the charging current with the line open circuited. [6]
