

II B.Tech. II Semester Regular Examinations, April/May -2005**POWER SYSTEMS-I****(Electrical & Electronic Engineering)****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. Explain the following with neat diagrams:
 - (a) Hydrograph
 - (b) Flow duration curve
2. Describe the schematic arrangement of a thermal power station and explain the function of each briefly
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.
4.
 - (a) Explain Kelvin's Law for cables and list out its drawbacks
 - (b) Calculate the most economical cross-section of the conductor of a 4-KM long transmission line if it delivers a maximum current of 400 amperes and the years copper losses are such as to be caused by a constant current of 100 amperes. The energy cost is 10 Paise per KWh. The cost of the line is Rs.(50,000 a + 8,000) per KM. Resistance per KM per square cm of copper conductor is 0.173. The annual rate of interest and depreciation is 10%.
5.
 - (a) Draw and explain the sectionalized double bus bar system.
 - (b) With suitable diagrams explain the main and transfer bus arrangement.
6.
 - (a) Discuss the important points to be taken into consideration while selecting the size and number of units.
 - (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.
7.
 - (a) Distinguish between a.c. and d.c. resistance of a conductor. Why the two differ? Explain fully.
 - (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 is the G.M.R. of the conductors.
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.

- (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.

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1. (a) How do you classify hydro-electric power plants?
(b) Why governor is necessary for hydraulic turbines.
2. (a) What are the methods for arresting ash from flue gasses? Explain any one method in detail.
(b) Discuss the natural and forced draughts and list out the difference between them.
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.
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
 - (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) Explain the classification of sub-stations.
(b) Explain the advantages of outdoor sub-station as compared to the indoor sub-station
6. (a) What do you understand by the load curve? What information is conveyed by a load curve?
(b) Describe the desirable characteristics of a tariff.
7. (a) Prove that the inductance of a groups of parallel wires carrying current can be represented in terms of their geometric distances. Explain the meaning of the term self G.M.D and mutual G.M.D.
(b) A conductor is composed of seven identical copper strands each having a radius r. Find the GMR of the conductor.
8. (a) Derive from basic considerations an expression for the capacitance and charging current per km length of a single phase line made up of two solid round conductors of radius r meters and spaced at D meters. Neglect the effect of ground.

- (b) Determine the capacitance per km of a pair of parallel conductors 1.5cm in dia and spaced informing 65 cm apart in air. Also find charging current per km 1cm if line is working at 110KV.

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1. (a) With neat diagrams, discuss about penstocks and water hammer.
(b) A hydro-electric station operates with a mean head of 40 metres and is supplied from a catchment area of 600 km^2 over which the average rain fall is 150 cm per annum. If 65% of the total rainfall can be utilized, calculate, the average power that can be generated. Assume hydraulic efficiency 80% and electrical efficiency 90%.
2. (a) What are the methods for arresting ash from flue gasses? Explain any one method in detail.
(b) Discuss the natural and forced draughts and list out the difference between them.
3. (a) Define Half life period. Derive the expression for half life period. Mention the significance of it.
(b) Discuss various factors which affect the selection of site for a nuclear power plant.
4. Explain the following with neat diagrams:
 - (a) AC 3 phase 3 wire distribution system
 - (b) AC 3 phase 4 wire system
5. (a) Explain the classification of sub-stations.
(b) Explain the advantages of outdoor sub-station as compared to the indoor sub-station
6. (a) Define and explain the importance of the following terms in generations.
 - 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.
7. (a) Prove that the inductance of a groups of parallel wires carrying current can be represented in terms of their geometric distances. Explain the meaning of the term self G.M.D and mutual G.M.D.

- (b) A conductor is composed of seven identical copper strands each having a radius r . Find the GMR of the conductor.
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.
- (b) Explain the method of images for finding the capacitance of transmission line with ground.

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1. Explain the following with neat diagrams:
 - (a) Hydrograph
 - (b) Flow duration curve
2. (a) What are the methods for arresting ash from flue gasses? Explain any one method in detail.
(b) Discuss the natural and forced draughts and list out the difference between them.
3. Describe the construction and uses of nuclear reactor core.
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
 - (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) What is a sub-station? Name the factors that should be taken care of while designing and erecting a sub-station?
(b) Compare the indoor and outdoor sub-stations
6. (a) Define and explain the importance of the following terms in generations.
 - 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.
7. Determine the inductance per phase per km of a double circuit 3-phase line. The radius of each conductor is 20mm and the conductors are placed on the circumference of an imaginary circle of radius 7m forming a regular hexagonal figure.

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

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