MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE502/PC-EEE502 Power System-I

UPID : 005528

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer *any ten* of the following : [1 x 10 = 10]

(I) Why bundled conductors are mainly used in high voltage overhead transmission lines ?

(II) Does current through nearby conductors affect the internal flux of a current carrying conductor?

(III) Is there any discrimination against consumers in Simple rate tariff?

(IV) The draught which a chimney produces is called_____.

(V) The selection of size of conductors for a distributor in a distribution system is governed by_____

(VI) At the dead end of the conductor or when there is a change in the direction of transmission line, the type of the insulator used is_____

(VII) In which models of transmission lines, the full charging current assumed to flow over half the length of the line only ?

(VIII) The transmission capacity of a line at 50 Hz frequency as compared to that at 60 Hz frequency is higher or lower?

(IX) Mention one difference between a two-part tariff and a maximum demand tariff.

(X) In a coal fired power plant, electrostatic precipitators are installed to control emission of _____

(XI) For a line with conductor spacing of 6m, 6m, and 12m, Deq is_____

(XII) If the loss angle of a cable is δ, then the power factor is_____.

Group-B (Short Answer Type Question)

Answer *any three* of the following : [5 x 3 = 15]

2. Explain the function of Penstock and Surge tank. [5]
3. Define loss angle and discuss its importance in underground cable. [5]
4. Determine the ABCD constants for nominal π circuit of a transmission line. [5]
5. Explain different methods adopted for power factor correction. [5]
6. Discuss the effect of wind and ice on sag. [5]

Group-C (Long Answer Type Question)

Answer *any three* of the following : [15 x 3 = 45]

7. (a) Derive the expression for insulation resistance of the single-core cable. [8]
   (b) The insulation resistance of a single core cable is 495 MΩ /km. If the core diameter is 2.5 cm and the resistivity of the insulation is 4.5 x 1014 ohm-cm, find the insulation thickness. [7]
8. (a) Discuss the Ferranti effect. [5]
   (b) What do you mean by SIL (surge impedance loading)? What is its importance? [5]
   (c) Draw the phasor diagram of a medium transmission line (nominal T model) for lagging power factor load. [5]
9. (a) Discuss the impacts of the low power factor on the power system. [4]
   (b) An alternator is supplying a load of 300 kW at a power factor of 0.6 lagging. If the power factor is raised to unity, how many more kW can the alternator supply for the same kVA loading? [4]
   (c) A single-phase motor connected to 400 Volt, 50 Hz supply takes 31.7 Amp at a power factor of 0.7 lagging. Calculate the capacitance required in parallel with the motor to raise the power factor to 0.9 lagging. [7]
10. (a) Explain with a simple block diagram the working of a nuclear power station. [10]
    (b) Discuss the advantages and disadvantages of the nuclear power station. [5]

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11. (a) Discuss availability-based tariff. [5]

(b) The power factor of an industrial three-phase load of 490 kW is to be improved from 0.7 lagging to 0.97 lagging by connecting loss-free delta connected capacitors across the 6.6 kV, 50Hz supply. The cost of suitable capacitors and control gear is Rs 200 per kVAR and the annual tariff charge is Rs 120 per kVA maximum demand. The annual interest and depreciation charges are 15%. Calculate: The total kVAR rating of the capacitors required, the required value of capacitance per phase and the net annual saving. [10]

*** END OF PAPER ***

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