Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech (EE-NEW)/SEM-5/EE-502/2010-11
2010-11
POWER SYSTEM – I

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

                                         10 × 1 = 10

i) Stringing chart is useful for

   a) finding the sag in the conductor

   b) the design of tower

   c) the design of insulator string

   d) finding the distance between the towers.

ii) The use of a guard ring

   a) equalizes the voltage division between the insulator discs

   b) is unnecessary complication

   c) decrease string -efficiency

   d) none of these.

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iii) The presence of earth in case of overhead lines

    a) increases the capacitance

    b) increases the inductance

    c) decreases the capacitance

    d) decreases the inductance.

iv) The ac resistance of a conductor is greater than its dc value due to

    a) Skin effect only

    b) Proximity effect only

    c) Ferranti effect only

    d) Both (a) and (b).

v) The surge impedance of a transmission line is

    a) $\sqrt{LC}$ b) $\sqrt{C/L}$

    c) $\sqrt{L/C}$ d) $1\sqrt{LC}$.

vi) The surge impedance of 100 km long underground cable is 50 ohms. The surge impedance of a 40 km long similar cable is

    a) 20 ohms   b) 50 ohms

    c) $\frac{40}{50}$ ohms   d) none of these.

vii) Use of bundle conductors in EHV transmission system provides

    a) increased line reactance

    b) decreased capacitance

    c) reduced voltage gradient

    d) increased corona loss.

viii) The dielectric strength of the air under normal condition is about

    a) $100 \text{ kV}_p/\text{cm}$ b) $21 \cdot 1 \text{ kV}_p/\text{cm}$

    c) $30 \text{ kV}_p/\text{cm}$ d) $200 \text{ kV}_p/\text{cm}$.

ix) A synchronous compensator absorbs inductive reactive power. It is

    a) overexcited

    b) normally excited

    c) underexcited

    d) none of these.

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x) As the load factor of a generating plant increases the generation cost/kWh generated

    a) decreases   b) increases

    c) remains same   d) none of these.

xi) Transposition of transmission line is done to

    a) reduce line loss

    b) reduce skin effect

    c) balance line voltage b rop

    d) reduce corona.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2. What is arcing ground ? How can it the minimized ?

3. What is the difference between neutral earthing and equipment earthing ? Explain the purpose suggesting the limitations.

4. What is Ferranti effect ? Explain with phasor diagram.

5. Explain skin effect. On which factors does it depend ?

6. State the advantages and disadvantages of corona. What is understood by 24/7 ACSR conductor ?

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GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following.　　　3 × 15 = 45

7.　a)　What is Availability Based Tariff (ABT) ?

　　b)　What is 2-part tariff ? Explain how it is determined.

　　c)　A consumer is supplied energy at a rate of Rs. 150 per kVA of maximum diamond and Rs. 3,000 kWh of energy consumed. Calculate to annual electricity charges to be paid by the consumer having a maximum demand of 150 kW at an average power factor of 0·85 lagging. The annual load factor of the load is 0·65.　　3 + 5 + 7

8.　a)　What are the different causes of failure of overhead line insulators ?

　　b)　A transmission line conductor at a river crossing is supported from two towers at heights of 50 m and 80 m above water level. The horizontal distance between the towers is 300 m. If the tension in the conductor is 200 kg, find the clearance between the conductor and water level at a point midway between the towers. Weight of the conductor/metre is 0·844 kg.　　7 + 8

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9. a) Find out the expressions of maximum and minimum dielectric stress in a single core cable.

   b) What is the insulation resistance of a single core cable ? Prove that the insulation resistance is inversely proportional to the length of the cable.

   c) A single core cable for use on 11 kV, 50 Hz system has conductor area of 0·645 cm^2 and the internal diameter of sheath is 2·18 cm. The permittivity of the dielectric used in the cable is 3·5. Find the minimum and maximum electrostatic stress in the cable. Find the capacitance of the above cable per km length. Find the charging current. 4 + 4 + 7

10. a) What do your mean by transposition ? Why is it done ?

    b) Derive the expression for the inductance of a three phase transposed line.

    c) Determine the inductance of a 3-phase line operating at 50 Hz and the conductors are arranged in a horizontal plane with spacing such that D_{31} = 4m; D_{12} = D_{23} = 2m. The conductors are transposed and have a diameter of 2·5 cm. 4 + 6 + 5

11. Write short notes on the following : 5×3

a) Capacitance grading of underground cable

b) Choice of voltage for transmission line

c) Techniques adopted for improvement of string efficiency

d) Earthing transformer

e) Proximity effect.

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