Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(EE-OLD)/SEM-5/EE-502/2009-10

2009

POWER SYSTEM

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 : $10 \times 1 = 10$

i) Corona loss can be reduced by using

a) solid conductor of diameter d

b) hollow conductor of diameter $d + \delta d$

c) bundle conductor

d) both (a) and (b).

e) both (b) and (c).

ii) The insulation resistance of a cable of length 10 km is one mega-ohm. The resistance for 5 km length will be

a) 1 mega-ohm b) 2 mega-ohms

c) 0·5 mega-ohm d) none of these.

iii) By increasing the transmission voltage to its double value the same power can be despatched keeping the line loss

a) equal to original value

b) half of original value

c) one-third of original value

d) one-fourth of original value.

iv) Characteristic impedance of an underground cable is usually in the range of

a) 400 Ω - 500 Ω

b) 200 Ω - 300 Ω

c) 50 Ω - 100 Ω

d) none of these.

v) The dielectric strength of air under normal condition is about

a) 100 kV_p / cm b) 21·1 kV_p / cm

c) 30 kV_p / cm d) 200 kV_p / cm.

vi) The function of steel wire in an ACSR conductor is to

a) compensate skin effect

b) provide additional mechanical strength

c) reduce inductance

d) none of these.

vii) To obtain the maximum value of stress in cable the ratio (R/r) should be

a) 2·13 b) 2·718

c) 1·96 d) 1·5

viii) The inductance of a line is minimum when

a) GMD is high

b) GMR is high

c) GMD and GMR are high

d) GMD is low but GMR is high.

ix) In a 3 core cable the capacitance between 2 conductors (with sheath earthed) is 3 μF. The capacitance per phase is

a) 1·5 μF

b) 3 μ F

c) 6 μF.

x) In a transmission line having negligible resistance the surge impedance is

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

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

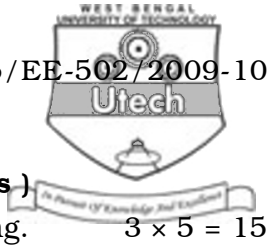
xi) Transposition of transmission line is done to

a) reduce line loss

b) reduce skin effect

c) balance line voltage drop

d) reduce corona.



GROUP – B

(Short Answer Type Questions)

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

2. What is the difference between neutral earthing and equipment earthing ?

3. What is charging current ? Calculate its value for single phase line.

4. In a suspension string of 3 disc units, the capacitance of each link pin to earth is 10% of self capacitance of one unit. If a voltage of 33 kV, 50 Hz is applied across the string, calculate the string efficiency. State the assumptions made.

5. Make a list of the principal equipment in a sub-station. Draw the layout of a sub-station.

6. How is vibration produced in a transmission line and how is it prevented ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) How are transmission lines classified ?

   b) Find the values of ABCD constants of a transmission line for end condenser method.

c) A three phase, 50 Hz, 20 km long overhead transmission line supplies 1100 kW at 11 kV, 0·8 p.f lagging. The resistance and inductance are 0·4 Ω and 0·8 mH per phase per km. Determine :

i) the line sending end voltage

ii) percentage regulation

iii) transmission efficiency of the line. 3 + 4 + 8

8. a) How is capacitance affected on the transmission lines ?

b) What do you understand by transposition of conductors ?

c) What are the factors which govern the inductances of a transmission line ?

d) Derive the expression of inductance of a 3-phase overhead transmission line. 2 + 2 + 2 + 9

9. Discuss the various methods of controlling reactive power at load end to consumer's terminal voltage fixed.

10. a) What is corona ? What are its characteristic features ? How to reduce the effect of corona ?

b) A 3 phase overhead transmission line has a span of 250 metre. Find the weight of the conductor per metre length if the sag, ultimate tensile strength and factor of safety are 1·5 metre, 5758 kg and 2·0 respectively.

11. Write short notes on any *three* of the following : 3 × 5

a) Earthing transformer

b) Proximity effect

c) String insulator efficiency and methods of its improvement

d) Resistance grounding.