



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(EE) / SEM-5 / EE-502 / 2011-12
2011
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 : $10 \times 1 = 10$
- i) The values of A, B, C, D parameters for a short transmission line with a series impedance of z are
 - a) $z, 0, 1$ and 1 respectively
 - b) $0, 1, 1$ and 1 respectively
 - c) $1, z, 0$ and 1 respectively
 - d) $1, 1, z$ and 0 respectively.
 - ii) Stranded conductors are used to
 - a) reduce transmission loss
 - b) increase mechanical flexibility
 - c) reduce skin effect
 - d) increase stability of the system.

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- vi) The function of earth wire in a transmission line is to
- a) prevent earth fault
 - b) provide a safety measure for any high flying objects
 - c) provide a shield to the phase conductors from direct lightning stroke
 - d) provide mechanical strength to the tower.
- vii) The insulation resistance of a cable of length 10km is $1\text{M}\Omega$. The insulation resistance of a similar cable of length 50km length will be
- a) $1\text{M}\Omega$
 - b) $5\text{M}\Omega$
 - c) $0.2\text{M}\Omega$
 - d) none of these.
- viii) Corona loss is less when the shape of the conductor is
- a) circular
 - b) flat
 - c) oval
 - d) independent of shape
- ix) The a.c. resistance of a conductor is greater than its d.c. value due to
- a) skin effect only
 - b) proximity effect only
 - c) Ferranti effect only
 - d) both (a) and (b).



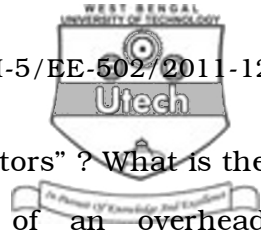
- x) ACSR in an overhead transmission line stands for
- a) Alloy Copper Steel Reinforced
 - b) Aluminium Conductor Steel Reinforced
 - c) All Cooper Steel Reinforced
 - d) None of these.
- xi) Corona loss increases with
- a) increase in supply frequency and conductor size
 - b) increase in supply frequency but reduction in conductor size
 - c) decrease in supply frequency and conductor size
 - d) decrease in supply frequency but increase in conductor size.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Define the term “string efficiency” in connection with suspension insulators. What are the different methods of improvement of string efficiency ?



3. What is meant by “transposition of conductors” ? What is the need of transposition of conductors of an overhead transmission line ?
4. What are the advantages of a.c. distribution system over d.c. distribution system ? Explain the term “ring main distributor” with a neat diagram and state its advantages.
5. What sort of information is obtained from a stringing chart ? Why is it important ?
6. Why are transmission lines classified based on their length ? Define regulation of a transmission line.

GROUP – C

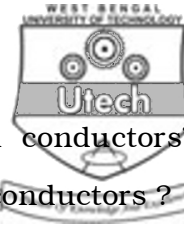
(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

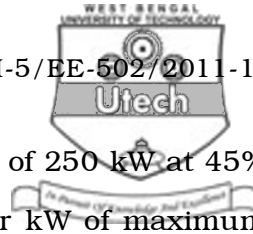
7. a) Show that the inductance per loop metre of a two-wire transmission line using solid round conductor is given by

$$L = 4 \times 10^{-7} \ln \left(\frac{D}{r'} \right) \text{ H, where } D \text{ is the distance between the}$$

conductors and r' is the GMR of the conductors. 10



- b) What is meant by the term “bundled conductors” ?
What are the advantages of this type of conductors ? 5
8. a) How is efficiency of a transmission line defined ? 3
- b) A short 3-phase transmission line connected to a 33kV, 50Hz, generating station at the sending end is required to supply a load of 10 MW at 0.8 lagging power factor at 30kV at the receiving end. If the minimum transmission efficiency is limited to 96%, determine the per phase values of resistance and inductance of the line. 12
9. A transmission line has a span of 214m. The line conductor has a cross-section of 9.225cm^2 and has an ultimate breaking strength of $2,500\text{ kg/cm}^2$. Assuming that the line is covered with ice and it provides a combined conductor and ice load of 1.125 kg/m , while the wind pressure is 1.5kg/m run. Calculate (i) the maximum sag produced and (ii) the vertical sag. Take a safety factor of 3.
10. a) What is meant by the term “tariff” ? 2
- b) Explain the following :
- i) Two-part tariff
 - ii) Maximum Demand tariff
 - iii) Availability based tariff. 6



- c) A consumer has a maximum demand of 250 kW at 45% load factor. If the tariff is Rs. 100 per kW of maximum demand plus 10 paise per kWh, find the overall cost per kWh. 7
11. a) What is corona ? 3
- b) What is meant by the “disruptive critical voltage” and “visual critical voltage” ? 6
- c) How can the corona loss be minimised in a transmission line ? 3
- d) Why are vibration dampers required in a transmission line ? 3

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