Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, May 2013
(2008 Scheme)
Branch : Electrical and Electronics
08.406 : POWER SYSTEM ENGINEERING – I(E)

Time : 3 Hours Max. Marks : 100

Instructions : 1) *Part – **A** : Answer **all** questions.*
2) *Part – **B** : Answer **one** question from **each** Module.*
3) ***Each** question carries **20** marks.*

PART – A **(10×4=40 Marks)**

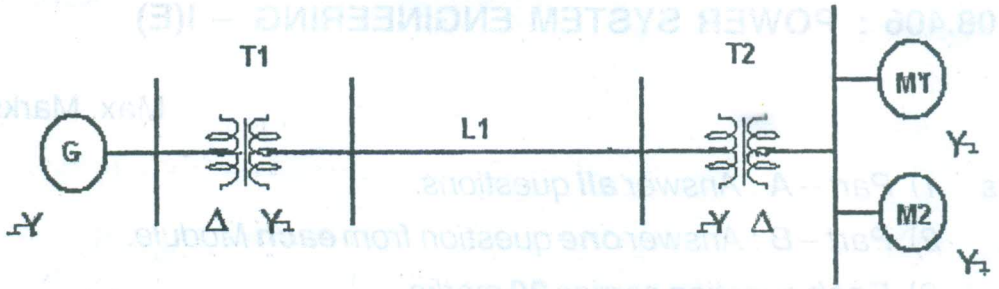
1. Find the inductance/phase/km of a three phase transmission line using 2 cm diameter conductor when these are placed at the corner of an equilateral triangle of each side 2 m.
2. What is Ferranti effect ? Deduce a simple expression for voltage rise of an unloaded line.
3. Define transmission efficiency and explain the effect of system voltage on it.
4. What is meant by equivalent T and equivalent π representations in transmission lines ?
5. List the different types of insulators used in power system. Give the application of each.
6. Explain the phenomenon of corona. Why bundled conductor lines have less corona loss than the lines with one conductor per phase ?
7. What is the function of sheath in cables ? How sheath losses can be reduced ?
8. Explain load factor and diversity factor. What are their effects on the cost of generation ?
9. What is the importance of power factor in the supply system ?
10. What is tariff ? Explain briefly the three part tariff.

P.T.O.

PART – B (20×3=60 Marks)

Module – I

11. a) Draw the per unit impedance diagram of the power system shown. Choose a base of 50 MVA, 11 kV on generator side.



Data :

G : 11 kV, 50 MVA, x = 15%

T_1 : 11/132 kV, 60 MVA, x = 10%

T_2 : Three single phase transformers each rated 11/76 kV, 20 MVA, x = 20%

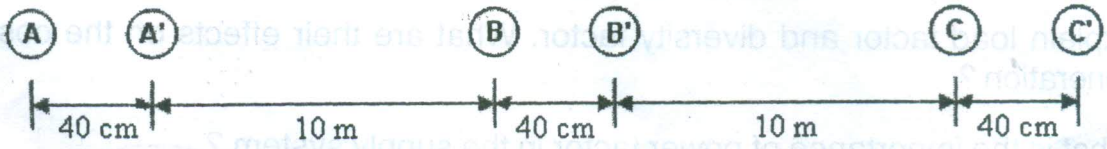
M_1 : 10.45 kV, 30 MVA, x = 20%

M_2 : 10.5 kV, 15 MVA, x = 20%

Transmission line : j 120 Ohms. 10

b) A 3 phase 132 kV overhead line delivers 50 MVA at 132 kV and power factor 0.8 lag at its receiving end. The constants of the line are A = 0.98 ∠3° and B = 110 ∠75° ohms per phase. Find (i) sending end voltage and power angle. (ii) sending end active and reactive power (iii) line losses and the VARs absorbed by the line. 10

12. a) Determine the capacitance and charging current per unit length of the line when the arrangement of the conductors is as shown. The line is completely transposed and the diameter one conductor is 15 cm. The line is operating at 220 kV, 50 Hz. 10



b) For a long transmission line, derive the expression for sending end voltage and current in terms of receiving end voltage and current. 10

Module – II

13. a) An overhead line has a span of 336 m. The line is supported from two towers whose heights are 33.6 m and 29 m above ground level. The weight of conductor is 0.833 kg/m and tension in the conductor is not to exceed 3.34×10^4 N. Find (i) clearance between the lowest point on the conductor and ground (ii) horizontal distance of this point from the lower support. 10

b) Compare the volume of conductors required for various systems of transmission. 10

14. a) A single core lead sheathed cable is graded by using three dielectrics of relative permittivity 5, 4 and 3 respectively. The conductor diameter is 2 cm and overall diameter is 8 cm. if the three dielectrics are worked at the same maximum stress of 40 kV/cm, find the safe working voltage of the cable. What will be the value of safe working voltage of an ungraded cable assuming the same conductor and overall diameter and the maximum dielectric stress. Comment on the results. 10

b) State the explain Kelvin's law. What are the practical limitations to the application of Kelvin's law ? 10

Module – III

15. a) A consumer has an average demand of 400 kW at a power factor of 0.8 lag and annual load factor of 50%. The tariff is Rs. 50 per kVA of maximum demand per annum plus 5 paise per kWh. The power factor is improved to 0.95 lagging by installing phase advancing equipment. Calculate :

i) the capacity of the phase advancing equipment

ii) the annual savings effected

The phase advancing equipment costs Rs. 100 per kVAR and the annual interest and depreciation together amount to 10%. 10

b) Compare the various power distribution systems. 10

16. a) A 2 wire DC distributor ABCDEA in the form of a ring main is fed at point A at 220 V and is loaded as follows : 10 A at B, 20 A at C, 30 A at D, 10 A at E. The resistances of various sections (go and return) are AB = 0.1Ω , BC = 0.05 Ω , CD = 0.01Ω , DE = 0.025 Ω and EA = 0.075 Ω . Determine :

i) point of minimum potential

ii) current in each section of the distributor. 10

b) A 2 wire DC distributor AB 300 m long is fed at both ends A and B. The distributor supplies uniformly distributed load of 0.25 A/m and concentrated loads of 40 A at C and 60 A at D. The distances AC and BD are 120 m each. The loop resistance of distributor is 0.1 ohm/100 m. Both A and B are maintained at 300 V. Find the currents fed at A and B and potentials of points C and D. 10
