

5E5045

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B.Tech. V Semester (Main/Back) Examination, Nov./Dec. - 2017
Electrical And Electronics Engineering
5EX5A Transmission & Distribution of Electrical Power
Common with EE

Time : 3 Hours**Maximum Marks : 80****Min. Passing Marks Main : 26****Instructions to Candidates :**

Attempt any **five** questions, selecting **one** question from each unit. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) Compare the cross-section area of a conductors for d.c. two wire system and 1- ϕ a.c. system assuming equal length, equal power and equal losses. (8)
- b) A 3 ϕ 4 wire system is used for lighting compare the amount of conductor materials required with that needed for a 2-wire d.c. system with the same lamp voltage. Assume the same losses and balance load. The neutral is one half the cross section of one of the respective outers. (8)

OR

1. a) Show that at higher voltage and higher power factor the efficiency of transmission line will be increased. What are the limiting factor of high voltage transmission line. (8)
- b) Describe the main limitation of Kelvin's law. The cost of 3 - ϕ over head transmission line having cross - sectional area $A \text{ cm}^2$ is Rs [500 + 2600 A] per KW. Calculate the most economical current density for the conductor if the rate of interest and depreciation is 12% per annum. The cost of energy wasted is Rs 0.05/kwh. The resistance of each conductor is 0.17/A ohm/kM. Take load factor for loss = 12%. (8)

Unit - II

2. a) Derive an expression for sag and tension in a power conductor strung between two support of equal heights taking into account the wind and ice loading also. (8)
- b) What are the various types of line support? Discuss the suitability of each with reference to system voltage and span. (8)

OR

2. a) What do the vibration get generated in conductors? How are they damped. (8)
b) A transmission line has a span of 15 m between level supports. The cross sectional area of the conductor is 1.25 cm^2 and weighs $100 \text{ kg} / 100 \text{ m}$. The breaking stress is $4220 \text{ kg} / \text{cm}^2$. Calculate the factor of safety if the 50 g of the line is 3.5m. Assume a maximum wind pressure of 100 kg/m . (8)

Unit - III

3. a) Derive an expression for the capacitance per unit length of 3 ϕ line completely transposed. What is the effect of earth on the capacitance of the line. (8)
b) Find out the flux linkage of single phase two wire line and derive an expression for inductance per unit length. (8)

OR

3. a) Show that the inductance per unit length of an overhead line due to internal flux leakage is constant and is independent of size of conductor. (8)
b) Derive formula to calculate the capacitance of a double circuit line. Also the conductors are of equal diameter and spaced hexagonally. (8)

Unit - IV

4. a) Write and explain the expression for power loss due to corona. What factor affected the corona losses. (8)
b) A 15 km long 3 ϕ overhead line delivers 5 mw at 11 Kv at 0.8 lagging power factor. Line loss is 12% of power delivered. Line inductance is 1.1 MH per km per phase. Find sending end voltage and voltage regulation. (8)

OR

4. a) Draw the equivalent circuit of a long transmission line. Derive from fundamentals the following relationships between sending end and receiving end voltage and currents.

$$V_s = AV_R + BI_R \quad \& \quad I_s = CV_R + DI_R \quad (8)$$

- b) What is ferranti effect? Explain it with the help of phasor diagram. (8)

Unit - V

5. a) Define string efficiency, Explain different method of improving string efficiency. (8)
b) With neat diagram explain constructional features of various types of cable. (8)

OR

5. a) Derive a formula for the electric stress in a single core cable. Where is maximum stress? Where is it minimum. (8)
b) A string of 4 insulators has self capacitances equal to 4 times the pin to earth capacitance. Calculate.
i) The voltage distribution across various unit as a percentage of total voltage across the string.
ii) String efficiency. (8)