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EN-501

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2005Roll No. **B. Tech.****(SEM. V) EXAMINATION, 2007-08
ELEMENTS OF POWER SYSTEM***Time : 3 Hours]**[Total Marks : 100**Note : Attempt all the five questions.*1. Attempt any **two** of the following : **2×10=20**

- (a) Compare the volume of conductor required for 3-phase, 3-wire system and DC 3-wire system where third wire is neutral and supposed to carry the current when one pole is out. Write the assumptions made.
- (b) Write the law which state the economical size of feeder conductor. What are the main limitations?
- (c) **fig. 1** shows a 1-phase line having resistance and reactance (go and return) as 0.06 and 0.1 ohm/km. The length of section AB and BC are 1.0 km each. The voltage at the further end is 220 volt. Find the voltage at sending end and the phase angle difference between voltages of two ends. The power factors of loads are with reference to the voltages at the load points.

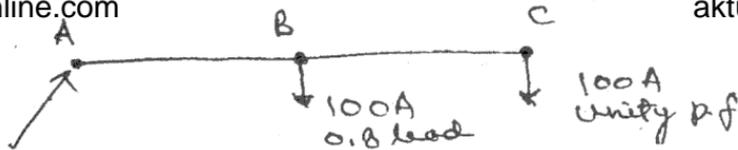


Fig. 1

2. Attempt any **two** of the following : 2×10=20

- (a) Using flux linkage approach, derive the inductance formula of a single circuit, 3-phase system (untransposed) and a symmetrically spaced configuration).
- (b) Find the capacitance per phase of symmetrically spaced double circuit, 3-phase lines.
- (c) A 3-phase, 100 km., transmission line is delivering 50 MW, 0.8 PF lagging at 132 kV. Each conductor is having resistance 0.1/ km, reactance $0.3 \Omega \text{ km}$ and shunt admittance $3 \times 10^{-6} \text{ mho/km}$. If load is balanced and leakage is neglected, calculate the sending end voltage, efficiency and regulation of the line using nominal representation.

3. Attempt any **two** of the following : 2×10=20

- (a) Derive the expression for critical disruptive voltage of air. Show that for a given distance d between two lines, the radius of the conductor when max critical disruptive voltage occurs, is (d/e) .
- (b) What are the main characteristics of an ideal insulator ? Describe the main advantages and disadvantages of glass insulators. Explain rating and string efficiency of an insulator.

- (c) A 3-phase overhead transmission line operates at 132 kV, 50Hz. The conductors are arranged in a 3.0 m delta configuration. What is a minimum diameter of conductor that can be used for no corona under a fair weather condition. Assume air density factor of 0.95 and irregularity factor of 0.85.

Attempt any **four** of the following : **4×5=20**

- (a) What are the main electrical considerations in design of transmission lines? Describe the factors affecting a mechanical design of overhead transmission lines.
- (b) Show that catenary formed by overhead transmission line having small span length is a parabola.
- (c) Explain the effect of wind on sag and tension of overhead transmission line.
- (d) What do you understand by vibration dampers in overhead transmission line? Describe the different types of dampers used.
- (e) Derive an expression for insulation resistance of a cable. How does it differ from conductor resistance ?
- (f) Classify cables according to voltage, location of use, no of cores and types of insulation.

Attempt any **two** of the following : **2×10=20**

- (a) What are the main limitations of HVAC transmission system? How does FACTS device useful for these ? Give some examples.
- (b) Describe the neutral grounding practices. What are the problems in ungrounded system ?
- (c) What are the main advantages and disadvantages of FACTS over HVDC transmission system ?