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B TECH

(SEM V) THEORY EXAMINATION 2017-18

ELEMENTS OF POWER SYSTEM

Time: 3 Hours ***Total Marks: 100***

Notes: *Attempt all Sections. Assume any missing data.*

SECTION -A

1. Attempt all question in brief: **(2x10=20)**
   a) How does isolator differ from circuit breaker?
   b) What is single line diagram of power system?
   c) What are the components of transmission line?
   d) What is transposition of transmission line?
   e) Write advantages of bundled conductor.
   f) Define the term Corona.
   g) What is the failure of insulators?
   h) Define Sag in transmission line.
   i) What is general construction of cable?
   j) What are the advantages of neutral grounding?

SECTION –B

2. Attempt any **three** parts of the following: **(10x3=30)**

   (a) Find the ratio of volume of copper required to transmit a given power over a given distance by overhead system using (i) DC two wire system (ii) 3-phase 4-wire system.
   (b) Derive A, B, C and D parameters for nominal π model of a medium transmission line and draw its Phasor diagram.
   (c) Explain the phenomenon of corona formation and factors affecting, reducing corona. What is visual critical voltage?
   (d) Why do you the vibrations get generated in conductors? How are they damped? Explain effect of wind and ice loading on the mechanical design of a line.
   (e) What are advantages of HV DC transmission? Discuss various types of HVDC links.

SECTION –C

3. Attempt any **one** parts of the following: **(10x1=10)**

   a) State and explain Kelvin's law for economic size of conductor. Discuss limitations. Show how Skin effect increases effective resistance of the conductor.
   b) Determine the best current density in amperes/mm^2 for a three phase overhead line. The line is in use for 3600 hours per year and if the conductor costs Rs. 3.0 / kg. It has a specific resistance of 1.73 x 10^{-8} Ω-m and weighs 6200 kg / m^3.cost of energy is 12 paise / unit. Interest and depreciation is 10 % of conductor cost.

4. Attempt any **one** parts of the following: **(10x1=10)**

   a) Derive an expression for the capacitance of a single phase overhead transmission line. What do you mean by self G.M.D. and mutual G.M.D.
   b) A two conductor, single phase line operates at 60 Hz. The diameter of each conductor is 5 cm and is spaced 3 m apart: calculate (i) the capacitance of each conductor to neutral per Km (ii) line to line capacitance (iii) capacitive susceptance to neutral per km.

5. Attempt any **one** parts of the following: **(10x1=10)**

a) Describe pin type, suspension type, and strain type insulators with net sketch.
b) Explain the methods of equalizing the potential across the string insulator. And define string efficiency.

6. Attempt any **one** parts of the following: **(10x1=10)**

a) Explain catenary method for the calculation of sag and tension in transmission line.
An overhead line has a span of 200 metres, the line conductor weighs 0.7 kg per meter. Calculate the maximum sag if allowable tension in the line is 1,400 kg. Prove formula used.
b) What is grading of cable? Why is it necessary? Explain Capacitance grading with suitable circuit Diagram.

7. Attempt any **one** parts of the following: **(10x1=10)**

a) What are earthing and neutral grounding? Discuss different methods of neutral grounding with net sketch. Also give advantages.
b) Describe the various conductor configurations and choice of voltage, number of circuits for EHV Transmission lines. Make Economic comparison of EHV-AC & HVDC system.