

**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  $\pi$  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<sup>2</sup> 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  $1.73 \times 10^{-8} \Omega\text{-m}$  and weighs 6200 kg / m<sup>3</sup>.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.