

B.E. Electrical (Electronics & Power) Engineering (MODEL CURRICULUM) Sem-V  
**TE104(PCC) : Power Systems-I (Apparatus and Modelling)**

P. Pages : 2

Time : Three Hours



**GUG/W/22/13867**

Max. Marks : 80

- Notes :
1. Read the question paper carefully (Branch, Semester, Scheme) before attempting the questions.
  2. Every question has equal weightage.
  3. Use of programmable calculator is prohibited.
  4. Assume suitable data wherever necessary.
  5. Draw neat and proper diagram/sketches.
  6. Don't use red pen for writing the answers.
  7. Don't write any other comments except answers of questions.
  8. All questions carry equal marks.
  9. Due credit will be given to neatness and adequate dimensions.
  10. Illustrate your answers wherever necessary with the help of neat sketches.
  11. Use of slide rule, Logarithmic Tables, Steam Tables, Mollier's Chart, Drawing Instruments, Thermodynamic tables for moist air, Psychometric Charts and Refrigeration charts is permitted.

1. a) Explain why for transmission purpose conductors are stranded & used in bundled? Give few configurations generally used. Illustrate with neat diagram. 6
- b) What do you mean by skin & proximity effect? 5
- c) Give the sample structure of modern power system with single line diagram. 5

**OR**

2. a) What are the advantages & limitations of High & very high transmission voltage? Give the standard voltage levels for HV, EHV & UHV transmission. 8
- b) A three phase line has impedance of  $0.4 + j 2.7$  ohm. The line feeds balanced two three phase loads that are connected in parallel. The first load absorbs 560 kVA at 0.707 power factor lagging. The second load absorbs 132kVA at unity power factor. The line to line voltage at the end of the line is 3810.5V. 8  
Determine;
  - 1) The magnitude of the line voltage at source end of the line
  - 2) The real and reactive power loss in the line
  - 3) Real power and reactive power supplied at the sending end of the line.

**OR**

3. a) Derive an expression for inductance of 3-phase line with unsymmetrical spacing. 8
  - b) A 15000 KVA load is received at 33 KV & 0.85 p.f. lagging, over 8 km. 50 Hz, 3-phase transmission line, find i) Sending end voltage, current & p. f ii) Voltage regulation iii) Transmission efficiency. given that Resistance & Reactance of each conductor is  $2.32\Omega$  &  $5.20$  Ohms respectively. 8
4. a) Derive the formulae for obtaining active & reactive powers at sending end & receiving end of transmission line in terms of its generalized constants. 8
  - b) What are the advantages of per unit impedances? Show that per unit impedance for the transformer derived from either side gives same values. 8

5. a) What is meant by insulation coordination? Explain its application to power system equipment. **8**
- b) Explain various methods to control switching over voltages. **8**
- OR**
6. a) Draw a cross sectional views of a non-linear resistor lightning arrestor and explain its operation. Give a typical of L.A. **8**
- b) Explain the mechanism of lightning strokes including high over voltages on transmission line. **8**
7. a) Determine the symmetrical components of current in a three phase system. The original phasors are:  
 $I_a = 12 + j8A$   
 $I_a = 12 - j6A$   
 $I_a = -12 + j6A$  **8**
- b) Derive the equation of transmission line impedances in terms of symmetrical components. Show that zero sequence impedance greater than positive and negative sequence impedance. **8**
- OR**
8. a) Three identical resistor are star connected to form a 3- $\phi$  unit rated at 2300V, 500K.V.A. The three phase unit of resistor is connected to Y-side of  $\Delta - Y$  transformer. The voltages at the resistor are:  
 $|V_{ab}| = 1840V$   
 $|V_{bc}| = 2760V$   
 $|V_{ca}| = 2300V$  **8**
- b) Write short notes on **any two**. **8**
- 1) Over current protection
  - 2) Distance protection
  - 3) Vacuum circuit breaker
  - 4) SF6 circuit breaker.
9. a) What is the need for interconnection of systems? Explain the merits of connecting HVAC systems by HVDC tie-lines? **8**
- b) a) Discuss the different factors that favor HVDC transmission systems over EHVAC transmission over long distances. **8**
- b) What are the different HVDC links normally adopted?
- OR**
10. a) Explain the operation of fixed speed wind turbine system with a single output Squirrel Cage Induction Generator with the help of a block diagram highlighting all the technical aspects, advantages and limitations. **8**
- b) Write short notes on **any two**. **8**
- a) Explain the working principle of a solar cell
  - b) Explain the construction of a solar cell with a neat figure
  - c) Write down clearly all the important concepts of Solar cells.

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