

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester - V  
**TE104 - Power Systems-I (Apparatus and Modelling)**

P. Pages : 2

Time : Three Hours



**GUG/S/23/13867**

Max. Marks : 80

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

1. a) Explain modern structure of electrical power system with neat sketch of power flow. **8**  
b) What is micro grid? Explain it in brief. State the advantages and disadvantages of micro grid. **8**

**OR**

2. a) Explain conventional and nonconventional energy sources with along with the concept of distributed energy sources. **8**  
b) What different type of energy storages. Explain each in brief. **8**
3. a) Derive the formula for calculating inductance of 3- $\phi$  transposed lines. **8**  
b) Define GMD & GMR. How this concept can be used in the calculations of inductance of composite conductor lines. Derive the formula for same. **8**

**OR**

4. a) Which factors governs the capacitance of a transmission line? Derive the expression for capacitance of 3- $\phi$ , unsymmetrical placed transposed lines. **8**  
b) Derive the equation of voltage regulation of short transmission line. Obtain the condition for zero voltage regulation. **8**
5. a) Explain the mechanism of lightning strokes including high over voltages on transmission line. **8**  
b) Explain various methods to control switching over voltages. **8**

**OR**

6. a) Derive the mathematical model for lightning discharges and explain them. 8
- b) Explain about protection of transmission line using search diverters. 8
7. a) Explain how unbalanced voltages & current can be resolved into symmetrical components. 8
- b) Explain different types of circuit breaker in brief as per arc extinguishing media. State advantages and disadvantages each one. 8

**OR**

8. a) Derive the equation of transmission line impedance in terms of symmetrical components. Show that zero sequence impedance greater than positive and negative sequence impedance. 8
- b) Explain different types of operating principal of protection scheme in brief. 8
9. a) What is the need for interconnection of systems? Explain the merits of connecting HVAC systems by HVDC tie-lines? 8
- b) With the help of a neat schematic diagram of a typical HVDC converter station explain the functions of various components available. 8

**OR**

10. a) Explain the operation of a 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 concept of solar cells.

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