B.E. / B.Tech. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester-V

TE104 / POWSYS1 - Power Systems-I - Apparatus and Modelling

P. Pages : 2 **GUG/W/24/13867**

Time : Three Hours * 5 5 0 3 * 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 answers 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, Psychrometric charts and Refrigeration charts is permitted.
6. Read the question paper carefully (Branch, Semester, Scheme) before attempting the questions.
7. Use of programmable calculator is prohibited.
8. Draw neat and proper diagram/sketches.
9. Don't use red pen for writing the answers.
10. Don't write any other comments except answers of questions.

1. a) Explain conventional and nonconventional energy sources with along with the concept of distributed energy sources. **8**

b) A 3-phase ring main ABCD fed at A at 11KV supplies balanced loads of 50A at 0.8 p.f. lagging at B, 120A at unity p.f. at C and 70A at 0.866 lagging at D, the load current being referred to the supply voltage at A. The impedances of the various sections are : Section AB = (1+j 0.6) Ω ; Section BC = (1.2 + j 0.9) Ω ; Section CD = (0.8 + j 0.5) Ω ; Section DA = (3 + j 2) Ω . Calculate the currents in various sections and station bus bar voltages at B, C & D. **8**

OR

2. a) Distinguish clearly the feeder, distributor & service main. **8**

b) What different type of energy storage. Explain each in brief. **8**

3. a) What do you mean by skin & proximity effect? Explain corona effect of transmission line. **8**

b) A 220 KV, 50 Hz, 200 Km long, $3-\phi$ line has its conductors on the corners of a triangle with sides 6 M, 6 M & 12 M. The conductor radius is 1.81 cm. Find the capacitance per phase per km, capacitive reactance per phase, charging current & total charging MVA. **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 formulae for obtaining active & reactive powers at sending end & receiving end of transmission line in terms of its generalized constants. **8**

5. 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 with sketch the various theories of charge generation and discharging a thunder. **8**

OR

6. a) Explain various methods of control switching over voltages. **8**

b) Explain different methods employed for lightning protection. **8**

7. a) Explain how unbalanced voltages & current can be resolved into symmetrical components. **8**

b) The line voltages of a 3 phase system are $50\angle 0^{o}\,V, 75\angle 100^{o}\,V$, and $100\angle 120^{o}\,V$. Find the symmetrical component of line voltages and star voltages. **8**

OR

8. a) Show that the zero sequence reactance of transmission line is greater than its positive sequence reactance. **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) 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) a) What are PV Modules and Arrays in Solar PV systems? **8**
b) Explain clearly with the help of suitable figures how the current and voltage levels of PV modules are increased by interconnecting them.

OR

10. a) With the help of a neat schematic diagram of a typical HVDC converter station explain the functions of various components available. **8**

b) What is the need for interconnection of systems? Explain the merits of connecting HVAC systems by HVDC tie-lines? **8**

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