Code No: 155CV **R18**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**B. Tech III Year I Semester Examinations, January/February - 2023**
**POWER SYSTEM – II**
**(Electrical and Electronics Engineering)**

**Time: 3 Hours** **Max. Marks: 75**

**Note:** i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

**(25 Marks)**

| | | |
|---|---|---|
| 1.a) | Give the formulas for transmission parameters of long lines. | [2] |
| b) | Give reasons for choosing π over T representation of lines. | [3] |
| c) | Give comparison between uncompensated and compensated lines. | [2] |
| d) | Explain about OLTC transformer as a voltage controller. | [3] |
| e) | What are the advantages of per unit system representation of system? | [2] |
| f) | Define reflection and refraction coefficients. | [3] |
| g) | Distinguish between surge diverters and rod gaps. | [2] |
| h) | What are volt-time curves? How are they useful? | [3] |
| i) | Give the classification of faults. | [2] |
| j) | What are symmetrical components? Explain. | [3] |

**PART – B**

**(50 Marks)**

2. A long symmetrical line with A = D = 0.9 $\angle 1.5^0$ and B = 150 $\angle 65^0$ Ω has at the load end a transformer having a series impedance $Z_T$ = 100 $\angle 67^0$ Ω. The load voltage and current are $V_L$ and $I_L$. Obtain expressions for $V_S$ and $I_S$ in form of: [10]

$$\begin{bmatrix} V_S \\ I_S \end{bmatrix} = \begin{bmatrix} A' & B' \\ C' & D' \end{bmatrix} \begin{bmatrix} V_L \\ I_L \end{bmatrix}$$

**OR**

3.a) A 40 MVA generating station is connected to a three-phase line having $Z = 300 \angle 75^\circ\ \Omega$; $Y = 0.0025 \angle 90^\circ\ \mho$. There is a load of 10 MW at unity power factor at the mid-point of the line. Calculate the voltage and load at the distant end of the line. Use nominal-T circuit for the line.

b) What is Ferranti effect in transmission lines? Explain. [5+5]

4.a) Explain the transmission line voltage control using shunt and series Capacitance methods. Discuss their merits and demerits.

b) What is load compensation? Discuss its objectives in power system. [6+4]

**OR**

5. A short 230 kV transmission line with a reactance of 18 Ω/phase supplies a load at 0.85 lagging power factor. For a line current of 1,000A the receiving- and sending-end voltages are to be maintained at 230kV. Calculate (a) rating of synchronous capacitor required, (b) the load current, (c) the load MVA. Power drawn by the synchronous capacitor may be neglected. [10]

6. Draw the per unit impedance diagram on a common base for the system shown in below figure 1. All per unit impedances shown are with respect to their own base. Take the system base MVA same as generator MVA and system base KV as generator side voltage. [10]

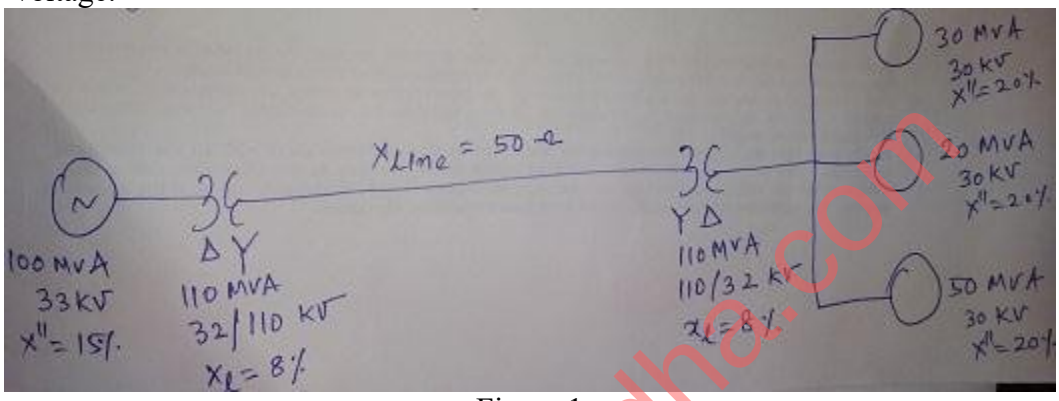


Figure 1

**OR**

7.a) A 500 kV, 2microsecond rectangular wave travels on a line having a surge impedance of 350 Ohm and approaches a termination with a capacitance C equal to 300 pF. Determine the magnitudes of the reflected and transmitted waves.

b) From fundamentals obtain the expressions for reflection and transmission co-efficient on a line terminated with load impedance equal to the surge impedance of the line. [5+5]

8.a) Briefly discuss about various causes of over-voltages in the power system network.

b) Explain the various methods of transmission line protection against over voltages due to lightning strokes. [5+5]

**OR**

9. Explain, with a neat sketch, the working principle and constructional details of expulsion type lightning arrester. [10]

10.a) The line currents in a three phase system are:

$$I_a = 72.1\angle 33.7^\circ,\ I_b = 82.46\angle 166^\circ,\ I_c = 63.24\angle -71.56^\circ$$

Calculate the symmetrical components of current.

b) An 11.2 kV bus-bar is fed from three synchronous generators as shown in figure 2 below. Calculate the fault current and MVA if 3-phase symmetrical fault occurs on the bus-bar. [5+5]

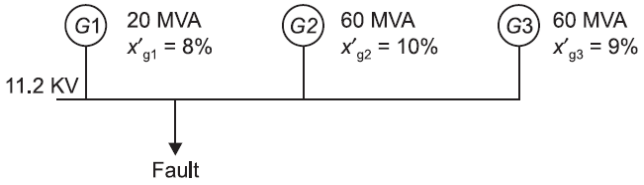


Figure 2

**OR**

11. A double line to ground fault occurs on phases b and c at point F in the system shown in figure 3 below. Find the fault current in phase c of $G_1$. Both the machines are rated 1.2MVA, 0.6kV with $X_1 = X_2 = 0.1$ p.u. and $X_0 = 0.05$ p.u. Transformers are 1.2 MVA each with leakage reactance of 0.05 p.u. Transmission line reactances are $X_{L1} = X_{L2} = 0.2$ p.u. and $X_{L0} = 0.4$ p.u. on the MVA base of the machines. [10]

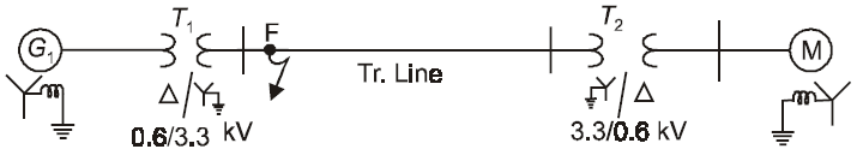


Figure 3

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