Code No: 155CV **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, August - 2022
POWER SYSTEM – II
(Electrical and Electronics Engineering)

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

Answer any five questions
All questions carry equal marks
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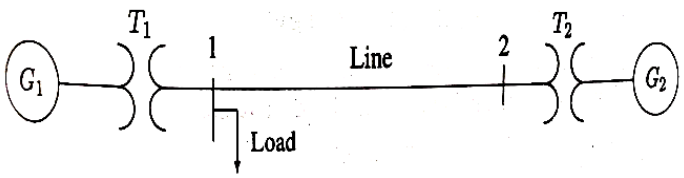
1.a) Deduce an expression for voltage regulation of a short transmission line, giving the phasor diagram.
b) A 3-phase, 50Hz, 150km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 ohm, 0.5 ohm and 3×10^{-6} mhos per km per phase. If the line delivers 50MW at 110kV and 0.8 p.f. lagging, determine the sending end voltage and current. Assume a Nominal-π circuit for the line. [7+8]

2.a) Explain the procedure how to draw the receiving end power circle diagram of a transmission line.
b) What is ferranti effect? Deduce a simple expression for the voltage rise of an unloaded transmission line. [8+7]

3.a) Describe the principle of on-load tap changing transformer? List out its merits and demerits.
b) A single circuit 3-phase, 220 kV line runs at no load. Voltage at the receiving end of the line is 205 kV. Find the sending end voltage, if the line has resistance of 20 ohm, reactance of 85 ohm and the total succeptance of 5.25×10^{-4} mho. The transmission line is to be represented by Π-model. [7+8]

4. Describe clearly what you mean by compensation of lines? Discuss different methods of compensation. [15]

5.a) What are the advantages of the per unit system for analysis of power system.
b) Draw an impedance diagram for the electric power system shown in figure showing all impedances in per unit on a 100 MVA base. Choose 20 kV as the voltage base for generator. The 3-phase power and line –line ratings are given below: [6+9]
G_1 : 90 MVA, 20 kV, X= 9%
T_1 : 80 MVA, 20/200 kV, X= 16%
T_2 : 90 MVA, 200/20 kV, X= 20%
G_2 : 90 MVA, 18kV, X= 9%
Line : 200 kV, X =120 ohms
Load: 200 kV, S = (48+j64) MVA



6.a) Explain the generation of traveling waves on a transmission line.

b) A 200 kV surge travels on a transmission line of 400 ohms surge impedance and reaches a junction where two branch lines of surge impedances of 500 ohms and 300 ohms respectively are connected with the transmission line. Find the surge voltage and current transmitted into each branch line. Also find the reflected voltage and current. [7+8]

7.a) Explain the construction, principle of operation and applications of valve type lightning arrester with diagram.

b) What are ground rods and counterpoises? Discuss clearly how these can be used to improve the grounding conditions. Give various arrangements of counterpoise. [7+8]

8.a) Describe the significance of positive, negative and zero sequence components.

b) A 30 MVA, 11 kV star connected generators has positive, negative and zero sequence reactance's of 30 %, 25 % and 10% respectively. A reactor with 6% reactance based on the rating of the generator is placed in the neutral to ground connection. A line to ground fault occurs at the terminals of the generator when it is operating at rated voltage. Determine the initial symmetrical line to ground rms fault current. Also find the line to line voltages. [6+9]

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