R18

Code No: 155CV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, July/August - 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)	List out the limitations of T and π methods of representation of lines?	[2]
b)	Explain clearly the "Ferranti effect" with a phasor diagram.	[3]
c)	What is the function of synchronous phase modifier?	[2]
d)	Explain the role of shunt and series capacitors in voltage control.	[3]
e)	Write is the need for Per Unit form of representation.	[2]
f)	What are the reflection and refraction coefficients of a short circuited line?	[3]
g)	What are the functions of grounding in power system?	[2]
h)	What are the causes of over voltages in an electrical system?	[3]
i)	Define negative sequence and zero sequence components.	[2]
j)	Write the symmetrical components of three phase system.	[3]

PART – B

(50 Marks)

2.a) A single phase overhead transmission line is delivering 600kVA load at 2kV. It's resistance and reactance are 0.18 ohm and 0.36 ohm per phase. Determine the voltage regulation if the load power factor is i) 0.8 P.F lag ii) 0.8 P.F lead.

b) Derive the A, B, C and D constants of long transmission lines using Rigorous solution. [5+5]

OR

3.a) Explain the effect of power factor on regulation and efficiency of a transmission lines.

b) A 3-phase, 50 Hz, 150 Km long line has a resistance, inductive reactance and shunt capacitive admittance of 0.1 Ohm, 0.5 Ohm, and 3×10^{-6} mho/ Km/ phase. If the line delivers 50 MW at 110 KV and 0.8 pf lagging. Determine the sending end voltage and current. Assume nominal Pi model for the line. [4+6]

4.a) Explain the working of on-load tap changing transformer for voltage control.

b) What is uncompensated transmission line? What is the difference between compensated and uncompensated lines? [5+5]

OR

5.a) What is loadability of transmission line? What are the characteristics of transmission lines?

b) What are the methods of voltage control and explain shunt capacitor briefly? [5+5]

6.a) A synchronous generator is rated at 150MVA, 22kV has a reactance of 0.25 p.u and is connected to an overhead line through a transformer rated 200 MVA, 230/18 kV star delta with Xp.u is 0.21. Find the p.u reactance by considering the (i) generator ratings and (ii) transformer ratings as base values.

b) Prove that the velocity of propagation of travelling waves is equal to the velocity of light. [5+5]

OR

7.a) Show that the per unit equivalent impedance of a two winding transformer is the same whether the calculations is made from H.V. side or the L.V. side.

b) Prove that the voltage and current waves are get attenuated when travelling over the line. [5+5]

8.a) What are the various types of lighting arresters? Explain, with a neat sketch, the working of valve type lightning arrester.

b) Derive an expression for the reactance of the Peterson coil in terms of the capacitance of the protected line. [5+5]

OR

9.a) Describe the insulation coordination with necessary characteristics.

b) What is lightning? Describe the mechanism of lighting discharge by drawing suitable diagrams. [5+5]

10.a) Derive an expression for fault current in Line to ground fault. Also draw sequence network connections.

b) Determine the symmetrical components for the three phase currents. [5+5]

$I_R = 15\angle 0^0$, $I_Y = 15\angle 230^0$ *and* $I_B = 15\angle 130^0$ *A*

OR

11.a) What is a 3-Phase unsymmetrical fault? Discuss the different types of unsymmetrical faults that occur in a 3-Phase system.

b) Determine short circuit MVA at the bus bars of a generating station 500 MVA and other station is 200 MVA. The generated voltage of each station is 12 kV. Also find the possible short circuit MVA at each station when they are linked by an inter connected cable with a reactance of 0.6 Ω. [5+5]

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