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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (EEE: CBCS) V-Semester Supplementary & Backlog Examinations, May-2019

Power Systems-II

Time: **3** hours Max. Marks: **70**

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Obtain the A, B, C, D parameters of a short line?
2. Draw circuit and phasor diagrams for nominal $-\pi$ configuration of medium transmission lines.
3. Show that per unit impedance of the transformer is same whether referred to primary or secondary side of the transformer.
4. Define load flow study.
5. A transformer is rated at 11 / 0.4kV, 500kVA, 5% reactance. Determine the short circuit MVA of the transformer when connected to infinite bus.
6. The generator emf is 1 pu and the sub transient reactance is 25%. Find the subtransient current.
7. Draw the vector diagram with the help of sequence components to obtain the phase voltages.
8. Given $I_a = 500+j150$, $I_b = 100- j400$, $I_c = -300+j600$ amps find I_{a0}, I_{a1}, I_{a2}
9. A surge of 100kV travelling in a line of natural impedance of 600Ω arrives at a junction with two lines of impedances 800Ω and 200 Ω respectively. Find the surge voltages and currents transmitted into each branch lines.
10. Why a short length of cable is connected between the dead end tower and the terminal apparatus in a substation?

Part-B (5 × 10 = 50 Marks)

11.a) A 3 phase, 3km line delivers 300kW at a power factor of 0.8 lagging to a load. If the voltage at the supply end is 11kV, Determine the voltage at the load end, percentage voltage regulation, sending end power factor and the efficiency of transmission. The resistance and reactance per km of each conductor are 0.4Ω and 0.3Ω respectively. [5]

b) From the fundamentals, derive the expression for critical disruptive voltage. [5]

12.a) If a transmission line has 0.2pu impedance on a base of 132 kV, 100MVA. What is its value on base of 50MVA at 220kV? [2]

b) For the network shown in fig (i), obtain the complex bus bar voltage at bus 2 at the end of first iteration? Use GS method. The line impedances are given by $Z_{12} = 0.04+j0.06$pu, $Z_{23} = 0.02+j0.03$pu Bus 1 is slack bus with $V_1 = 1.0 \angle 0^0$, $P_2+jQ_2 = -5.96+j1.46$ $V_3 = 1.02$; Assume $V_3^0 = 1.02\angle 0^0$; $V_2^0 = 1\angle 0^0$ [8]

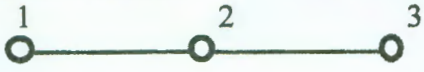

Fig (i)

13.a) An alternator and a synchronous motor each rated for 50MVA, 13.2kV having sub transient reactance of 20% are connected through a transmission link of reactance of 10% on the base of machine ratings. The motor acts as a load of 30MW at 0.8pf lead and the terminal voltage 12.5kV when a 3-phase fault takes place at the motor terminals. Determine the sub-transient current in the alternator, motor and at the fault. [5]

b) List out the steps to form Z bus for a power system. [5]

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14.a) Derive the fault currents for a single line to ground and line to line faults on unloaded generator. [8]

b) Under what conditions LG fault is severe than 3-phase fault. [2]

15.a) Obtain the coefficient of reflection and refraction for an open circuited transmission line of characteristic impedance Z_c [6]

b) Discuss the causes of over voltages in power system. [4]

16.a) Derive the expression for incident and reflected components of voltages at any point along a transmission line in terms of receiving end voltage, current and line parameters. [5]

b) Explain the decoupled load flow method with necessary equations. [5]

17. Answer any ***two*** of the following:

a) Discuss the phenomenon taking place during the period of a symmetrical three – phase short circuit at the terminals of an alternator. [5]

b) Derive the sequence impedances of a transmission line having self impedance Z_s and mutual impedance Z_m [5]

c) Explain Bewley Lattice diagram. [5]