Code No: **R32022** **R10** **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April - 2018

POWER SYSTEM ANALYSIS

(Electrical and Electronics Engineering)

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

Answer any FIVE Questions

All Questions carry equal marks

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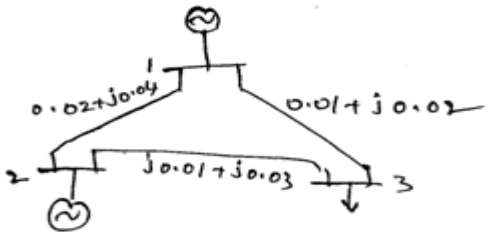
1 A 350MVA, 26 kV, three phase generator has a subtransient reactance of 10%. The generator supplies two synchronous motors through a 50 km transmission line having transformers at both ends. In This, first transformer is a three phase, 200MVA, 26/230 kV, 20% reactance and second one is made of three single phase transformers of rating 150MVA, 127/13.2 kV, 10% reactance. Synchronous motors ratings are 100MVA and 75 MVA and both operating at 13.2 kV with 15% subtransient reactance. Series reactance of transmission line is 0.25 ohm/ km. Draw the reactance diagram with all the reactance's marked in p.u. [15M]

2 a) Derive general expression for static power flow equations for 'n' number buses. [8M]

b) Write an algorithm for gauss-seidal method when including generator buses [7M]

3 The power system network shown in below network, obtain V_2 and V_3 using decoupled load flow method at the end of first iteration. The impedance values in p.u indicted in the network. [15M]



Bus code	$\|V\|$	Generation MW	MVAR	Load MW	MVAR
1	1.03	-	-	-	-
2	1.0	17		12	8
3	1.0	0	0	50	20

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4 Build the Z_{Bus} using building algorithm for a power system whose element data is given in the following table: [15M]

Element No.	Connected between bus No.	Self reactance (p.u)
1	1-2	0.2
2	1-3	0.1
3	2-3	0.4
4	1-3	0.15

5 A 120 kV line has a impedance of (3+ j12) ohm, is connected to a generating station bus bar through a 15MVA step up transformer which has a reactance of 10%. The station has two generators rated 7.5 MVA with 10% reactance and 5 MVA with 7.5% reactance. Determine the fault current and short circuit MVA when a three phase fault occurs at the LV terminal of the transformer and at the end of the line. [15M]

6 a) Obtain the expressions for sequence impedances of a 3-phase, 3-wire un-transposed transmission line. Also draw the sequence impedance networks. Assume that the transmission line is having mutual impedance from phase to phase. [8M]

b) Draw and explain the positive, negative and zero sequence impedance diagrams for different 3-phase transformer winding connections. [7M]

7 a) Derive the expression for fault current and the terminal voltages of a 3-phase alternator, when there is a line to line fault occurs at the far end of the alternator. Assume that the generator neutral is solidly earthed. [8M]

b) A 50 Hz, 12 kV, 50 MVA alternator has $X_1=X_2=$ 15% and $X_0=8\%$ and the neutral is grounded through a reactor of 0.3 ohms. Find the initial symmetrical RMS current is the ground reactor when a double line to ground fault occurs at the generator terminals at the time when the generator voltage was 11.5 kV. [7M]

8 a) Discuss the various recent methods to improve the transient stability? [8M]

b) What are the various applications for equal area criterion? Explain [7M]

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