TEE-601 206

Even Semester Examination 2017-18

B.TECH. (SEMESTER-VI)

POWER SYSTEM ANALYSIS

Time: 03:00 Hours **Max Marks : 100**

Note : Attempt all questions. All questions carry equal marks.

1. Attempt any **FOUR** parts : (5 X 4)

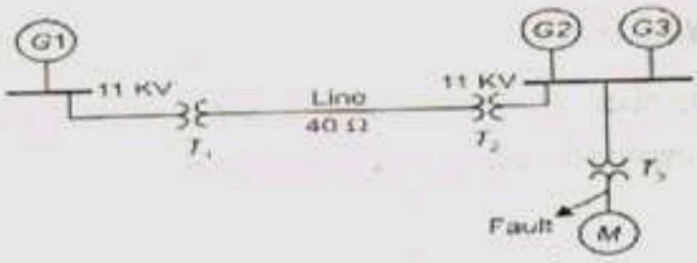
   (a) What is per unit representation of power system? Write advantages of per unit system?

   (b) Show that per unit impedance of transformer referred to either side remains same if voltages bases are in ratio of transformation.

   (c) What do you understand by Symmetrical components of unbalanced phasors? Deduce expression for symmetrical components.

   (d) Determine the per unit impedance of transmission line having an impedance of transmission line having an impedance of (30+j110) on 100MVA and 132 kV base voltage.

   (e) A balanced fault occurs at point F. Determine fault MVA and Fault Current [Select Base MVA =40 MVA and Base KV= 11 kV in Generator (G_1) Circuit.]



G1: 11 kV, 40 MVA, 15 %

G2: 11 kV, 20 MVA, 10 %

G3: 11 kV, 20 MVA, 10 %

T1: 40 MVA, 11/66 kV ,15 %

T2: 40 MVA, 66/11 kV, 15 %

T3: 5 MVA, 11/6.6 kV, 8 %

(f) Draw the zero Sequence networks for various combination of Transformer

2. Attempt any **FOUR** parts : (5X4)

(a) Find expression for fault current and develop the connection diagram of sequence networks for single line to ground (L-G) fault.

(b) What are the basic assumptions made in fault calculation

(c) An 11 KV, 25MVA alternator has positive, negative and zero sequence reactance of 0.12, 0.12 and 0.08 per unit respectively. The generator neutral is grounded through a reactance of 0.03 per unit. Assuming pre fault unloaded condition, determine fault current when a single line to ground fault occurs at generator terminals.

(d) What are sequence networks? Discuss their importance in unsymmetrical fault calculations?

(e) Discuss current limiting reactors. Discuss their applications and locational aspects.

(f) What is swing equation used for stability studies in power system.

3. Attempt any **TWO** parts : (10X2)

(a) Derive the static load flow equations of the power system. Explain Newton Raphson method for solving load flow equation.

(b) Develop necessary equations and describe the load flow solution using Gauss-Seidel method when all type of buses are present in the system.

(c) What is bus admittance matrix. Develop bus admittance matrix for following line data

Line	Impedance	Charging admittance (p.u)y/2
1-2	0.4+j0.8	j0.04
2-3	0.2+j0.45	j0.03
1-3	0.15+j0.42	j0.02

And solve the given three bus system by G-S method for above Y-bus and bus data given below. Give the voltages at the end of first iteration. Take acceleration factor as 1.6

Bus	P(p.u)	Q(p.u)	V(p.u)
1	-	-	$1.04\angle 0^0$
2	0.5	-0.2	
3	-1.0	0.5	

4. Attempt any **TWO** parts : (10X2)

(a) Define and explain the (i) Steady state stability (ii) Transient stability. What are the methods for improving stability.

(b) Discuss different cases of transient stability of a power system when sudden Short Circuit of one of the parallel line occurs in the system .

(c) Describe equal area criterion for stability. And discuss about the transient stability of a power system when sudden loss of one of the parallel line occurs in the system

5. Attempt any **TWO** parts : (10X2)

(a) An over head line is connected in series with a cable. The overhead line has an inductance of 2 mH/km and capacitance of 0.01 μF/km. The cable has an inductance of 0.25 mH/km and Capacitance of 0.102 μF/km. If a surge having maximum value of 100 kv travels along the overhead line towards its junction with the cable, Calculate:

(i) The surge impedances of the line and the cable

(ii) The velocities of the wave propagation in the line and the cable.

(iii) The reflected and transmitted waves of voltages and current at the junction.

(b) Discuss the reflection and refraction of a travelling wave by drawing Bewlay's lattice diagram. Take a suitable example for explanation.

(c) Discuss the behavior of a traveling wave when it reaches the end of a (i) short circuited (ii) open circuited transmission line (iii) line terminated by impedance equal to surge impedance

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c) Define the expression of rise time, peak time and maximum peak overshoot for the second order system with step input.
d) What is the effect of location of poles on stability?.
e) The steady state error of a unity feedback linear system for a unit step input is 0.1. Determine the steady state error of the same system for a pulse input r(t) having a magnitude of 10 and a duration of 1sec

3. Attempt any **Two** Questions. (10X2=20)

(a) Find the value of k of $G(S)H(S) = {}^{k}/_{s(s+20)(s+2)}$ such that phase margin $=60^{O}$

(b) Draw bode plot for $(s)H(s) = \frac{1000}{s(1+0.1s)(1+0.001s)}$. Find

1) P.M and G.M.
2) gain cross over frequency and
3) phase crossover frequency.
4) Stability of the system

(c) What do you understand by phase lead network and what are its advantages and limitations. Write steps for designing phase lead network.

4. Attempt any **Two** Questions. (10X2=20)

(a) Draw root locus of for the system whose open loop transfer function is

$$G(s)H(s) = \frac{K}{s(s+4)(s+2+j4)(s+2-j4)}$$

(b) Write down the correlation between frequency domain and time domain.

(c) Draw the Nyquist plot for $G(s)H(s) = \frac{1}{s(s+1)(2s+1)}$

5. Attempt any **Two** Questions. (10X2=20)

(a) Solve following question using routh hurwitz criterion

(1) Check the stability of system using routh hurwitz criterion

$$S^5 + 5S^4 + 12S^3 + 13S^2 + 3S + 6 = 0$$

(2) find the value of K for system to be stable for system having characteristic

$$S(S^2 + 2S + 3)(S + 2) + K = 0$$

(b) Draw polar plot for

$$G(s)H(s) = \frac{20s}{(s+1)(s+10)}$$

(c) Explain the generalized error coefficients and error series.
For the closed-loop system with

$$G(S) = \frac{1}{s+5} \text{ and } H(S) = 5.$$

Calculate the generalized error coefficients and find error series.