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BTECH
(SEM VI) THEORY EXAMINATION 2024-25
POWER SYSTEM-II

TIME: 3 HRS

M.MARKS: 70

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

02 x 7 = 14

Q no.	Question	CO	Level
a.	During three phase fault which sequence component should be calculated? Explain with the reason.	1	K4
b.	Explain the need of load flow analysis.	2	K2
c.	Enumerate different types of buses and their significance in power system.	2	K1
d.	A 100 kV surge travels on an overhead line with a surge impedance of 500 Ω, which is terminated by a cable with a surge impedance of 50 Ω. Calculate the magnitude of the reflected and transmitted voltage?	3	K3
e.	Enumerate five factors affecting the transient stability of power system.	4	K2
f.	Classify relays based on their application.	5	K1
g.	Differentiate between restriking and recovery voltage.	5	K2

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

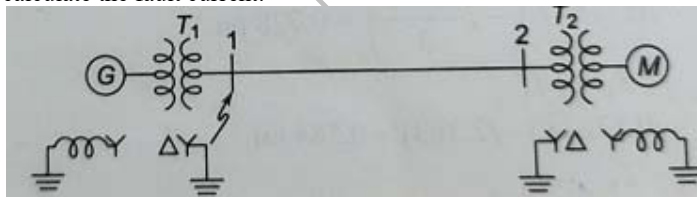
a.	A synchronous generator feeds bus 1 of a system. A power network feeds bus 2 of the system. Buses 1 and 2 are connected through a transformer and a transmission line. Per unit reactances of the various components are: Generator (connected to bus bar 1): 0.25 Transformer: 0.12 Transmission Line 0.28 The power network can be represented by a generator with a reactance (unknown) in series. With the generator on no load and with 1.0 pu voltage at each bus under operating condition, a three-phase short circuit occurring on bus 1 causes a current of 5.0pu to flow into the fault. Determine the equivalent reactance of the power network.	1	K4
b.	Explain Z_{BUS} building algorithms with all types of modification.	2	K2
c.	Explain Bewley's Lattice diagram. Prove the statement that an open circuited line behaves as a leading power factor network.	3	K2
d.	Derive power flow equations and prove that the reactive power flow in the transmission line is proportional to the difference between magnitudes of sending end and receiving end voltages.	4	K4
e.	Explain the working of overcurrent relay through neat diagram.	5	K2

SECTION C

3. Attempt any one part of the following:

07 x 1 = 07

a.	Derive the expression for fault current of double line to ground fault and draw the related sequence networks.	1	K2
b.	Design the positive, negative and zero sequence network of the system shown in mentioned figure when a single line to ground fault (on phase a) occurs on bus 1. Also calculate the fault current.	1	K5





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	The rating of the machines are 1200KVA, 600V with $X' = X_2 = 10\%$, $X_0 = 5\%$. T_1 is rated 1200KVA, 600V/3300V with leakage reactance of 5%, T_2 is rated 1200KVA, 3300V/600V with leakage reactance of 5%. The reactance of the transmission line are $X_1 = X_2 = 20\%$ and $X_0 = 40\%$ on the base of 1200KVA, 3300V. The reactance of the neutral grounding reactors are 5% on the KVA and voltage base of the machine.		
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4. Attempt any one part of the following: 07 x 1 = 07

a.	The one line diagram of a simple four bus system is shown in mentioned figure. The line impedances are mentioned in the table. The shunt admittances at all the buses are assumed to be negligible. (a) Find Y_{BUS} if the line shown dotted is not connected. (b) What modifications need to be carried out in Y_{BUS} if the line shown dotted is connected.	2	K5																		
<table border="1"><thead><tr><th>Line, bus to bus</th><th>R, pu</th><th>X, pu</th></tr></thead><tbody><tr><td>1-2</td><td>0.05</td><td>0.15</td></tr><tr><td>1-3</td><td>0.10</td><td>0.30</td></tr><tr><td>2-3</td><td>0.15</td><td>0.45</td></tr><tr><td>2-4</td><td>0.10</td><td>0.30</td></tr><tr><td>3-4</td><td>0.05</td><td>0.15</td></tr></tbody></table>				Line, bus to bus	R, pu	X, pu	1-2	0.05	0.15	1-3	0.10	0.30	2-3	0.15	0.45	2-4	0.10	0.30	3-4	0.05	0.15
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b.	Explain the application of Newton- Raphson method for load flow studies. Enumerate its advantages/disadvantages over Gauss-Siedel method.	2	K2																		

5. Attempt any one part of the following: 07 x 1 = 07

a.	A transmission line has an inductance of 16mH and a capacitance of 0.1µf is connected to a cable which is having an inductance of 1.6H and a capacitance of 1mf. If a surge of 40kV is transmitted from transmission line towards the cable. Find: i. Transmitted voltage wave in cable ii. Transmitted current wave in cable iii. Reflected voltage and current waves iv. Incident current wave	3	K5
b.	Explain the concept of Surge Impedance Loading (SIL). Calculate the expression for maximum power during SIL. Write advantages of SIL.	2	K2

6. Attempt any one part of the following: 07 x 1 = 07

a.	Explain equal area criteria to study transient stability. Elaborate the stability when mechanical input suddenly changed with the help of equal area criteria.	4	K2
b.	Derive the expression for effect of clearing time on stability.	4	K3

7. Attempt any one part of the following: 07 x 1 = 07

a.	Explain arc production, arc quenching/extinction and its methods in circuit breaker.	5	K2
b.	Explain following in detail: i. Fault clearing time ii. Relay time iii. Breaker time iv. Overreach v. Underreach	5	K2