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

TIME: 3 HRS

M.MARKS: 100

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

**SECTION A**

**1. Attempt all questions in brief.**

**2 x 10 = 20**

Q No.	Question	CO	Level
a.	Enumerate five advantages of per-unit system.	1	K2
b.	Describe the significance of zero sequence components.	1	K2
c.	Enumerate different types of buses and their significance in power system.	2	K2
d.	Explain the significance of slack bus in power system.	2	K2
e.	A 100 kV surge travels on an overhead line with a surge impedance of 500 $\Omega$ , which is terminated by a cable with a surge impedance of 50 $\Omega$ . Calculate the magnitude of the reflected and transmitted voltage?	3	K3
f.	Enumerate factors affecting steady state stability of power system.	3	K1
g.	Explain steady state stability and transient stability.	4	K2
h.	Enumerate five factors affecting the transient stability of power system.	4	K1
i.	Classify relays according to time.	5	K1
j.	Differentiate between restriking and recovery voltage.	5	K2

**SECTION B**

**2. Attempt any three of the following:**

**10 x 3 = 30**

Q No.	Question	CO	Level
a.	Derive the expression of fault current and fault voltage for line to line fault.	1	K2
b.	Explain $Z_{BUS}$ building algorithms with all types of modification.	2	K2
c.	A transmission line has an inductance of 16mH and a capacitance of 0.1 $\mu$ f 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	
d.	Explain swing equation for a machine connected to infinite bus and write its advantages/disadvantages over equal area criteria.	4	K2
e.	Explain operating principle of a relay.	5	K2

**SECTION C**

**3. Attempt any one part of the following:**

**10 x 1 = 10**

Q No.	Question	CO	Level						
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:  <table style="margin-left: 40px;"> <tr> <td>Generator (connected to bus bar 1):</td> <td style="text-align: right;">0.25</td> </tr> <tr> <td>Transformer:</td> <td style="text-align: right;">0.12</td> </tr> <tr> <td>Transmission Line</td> <td style="text-align: right;">0.28</td> </tr> </table> <p>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.</p>	Generator (connected to bus bar 1):	0.25	Transformer:	0.12	Transmission Line	0.28	1	K4
Generator (connected to bus bar 1):	0.25								
Transformer:	0.12								
Transmission Line	0.28								



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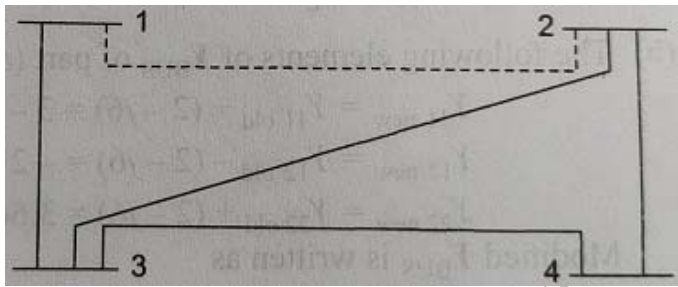
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b.	Explain symmetrical component transformation and prove that power remains invariant using symmetrical components.	1	K2
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**4. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level																		
a.	<p>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 <math>Y_{BUS}</math> if the line shown dotted is not connected. (b) What modifications need to be carried out in <math>Y_{BUS}</math> if the line shown dotted is connected.</p>  <table border="1" style="margin-top: 10px;"> <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	2	K5
Line, bus to bus	R, pu	X, pu																			
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2-4	0.10	0.30																			
3-4	0.05	0.15																			
b.	Explain the application of Newton- Raphson method for load flow studies. Enumerate its advantages/disadvantages over fast decoupled method.	2	K2																		

**5. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain Bewley's Lattice diagram. Calculate the reflection and transmission coefficient if a line terminated through a resistance.	3	K2
b.	Calculate the reflection and transmission coefficient of voltage and current of travelling waves under pure inductive loading and pure capacitive line loading.	3	K3

**6. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain equal area criteria to study transient stability. Elaborate the stability when sudden short circuit of one of the parallel line happens with the help of equal area criteria.	4	K2
b.	Derive the expression for effect of clearing time on stability.	4	K2

**7. Attempt any one part of the following: 10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain arc production, arc quenching/extinction and its methods in circuit breaker.	5	K2
b.	Explain the transformer protection using differential relay with a neat diagram.	5	K2