

**Roll No:** 

### BTECH

(SEM VI) THEORY EXAMINATION 2021-22

## **POWER SYSTEM-II**

# Time: 3 Hours

1.

# Total Marks: 100

10\*3 = 30

Note: Attempt all Sections. If you require any missing data, then choose suitably.

## SECTION A

| Attem | pt <i>all</i> questions in brief. 2  | *10 = 20 |
|-------|--|----------|
| Qno.  | Questions  | CO       |
| (a)   | A 25 MVA ,33KV alternator has a p.u impedance value of 0.9 p               | ou. 1    |
|       | Find the p.u impedance value at new base value of 50MVA at 11KV            | •        |
| (b)   | Mention the various assumptions taken in drawing a reactan                 | ce 1     |
|       | diagram of a power system network.   |          |
| (c)   | Explain generator bus. When generator bus is treated as load bus?          | 2        |
| (d)   | Mention the reasons why Y-Bus is preferred over Z Bus during los           | ad 2     |
|       | flow analysis.   |          |
| (e)   | Compute the velocity of propagation of travelling waves in                 | 3        |
|       | transmission lines.  |          |
| (f)   | Discuss why transmission lines are terminated by an underground cable.     | 3        |
| (g)   | What is the relation between angular momentum (M), inertia constant (H)    | 4        |
|       | and K.E of a synchronous machine?  | 0        |
| (h)   | Identify the difference between steady state stability and transient state | 4 7-     |
|       | stability of power system.   | <u> </u> |
| (i)   | Define pick up value of the relay.   | 5        |
| (j)   | Explain the arc phenomenon in circuit breakers.                            | 5        |
|       |  |          |

# SECTION B

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

Qno Questions CO (a) The phase voltages on the HV side of a step up transformer are 100 1 KV, 33 KV, 38 KV on phase a, b and c respectively. The voltages of phase a leads that of phase b by 100° and lags that of phase c by 176.5°. Determine the symmetrical components of the phase voltages. Draw a flow chart for load flow solution through gauss seidel method (b) 2 whenboth PV and PQ buses are present in the network. A 220 kV surge travels on a line of 400  $\Omega$  surge impedance and reaches (c) 3 a junction where two branch lines of surge impedances 550  $\Omega$  and 350  $\Omega$ , respectively are connected with the transmission line, Find the surge voltage and current transmitted and reflected into the lines.  $Z_1 = 550 \Omega$  $Z_c = 400 \Omega$  $Z_{2} = 350\Omega$ (d) Derive the expression for critical clearing angle when a fault occurs at 4 any one of the buses of standard system. Also mention the significance of critical clearing angle.



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| (e) | Explain high resistance and low resistance methods of arc extinction at | 5 |
|-----|---|---|
|     | the time fault.   |   |

### **SECTION C** Attempt any *one* part of the following:

10\*1 = 10

| Atten | $10^{-1} - 10$   |         |
|-------|--|---------|
| Qno   | Questions  | CO      |
| (a)   | Determine the fault currents and fault voltages when double line to ground fault occurs between phase b and cof an unloaded alternator.  | 1       |
| (b)   | The one-line diagram of three phase power system is shown in figure<br>Select a common base of 100 MVA and 22 KV on the generator side<br>Draw the reactance diagram. A 3-phase load of 60 MW, 0.6 P. 1<br>lagging at 10.5 KV is connected at bus. The line 1 and line 2 hav<br>reactance of 50 ohms and 65 ohms respectively.   | F       |
|       | $ \begin{array}{c}  T_{1} \\  T_{2} \\  T_{3} \\  T_{3} \\  T_{4} \\  T_{$ | 2       |
|       | Gen : 100 MVA, 22 KV, X= 0.18 p.u<br>Tr1 50 MVA, 22/220 KV, X=0.1 p.u<br>Tr2 40 MVA, 220/11KV, X=0.06p.u<br>T3 40 MVA, 22/110KV, X=0.065p.u<br>T4 50 MVA, 110/11KV, X=0.08p.u<br>Motor 70 MVA, 11KV, X=0.2 p.u   |         |
| Atten | 10 npt any <i>one</i> part of the following:   | *1 = 10 |

#### Attempt any *one* part of the following: 4.

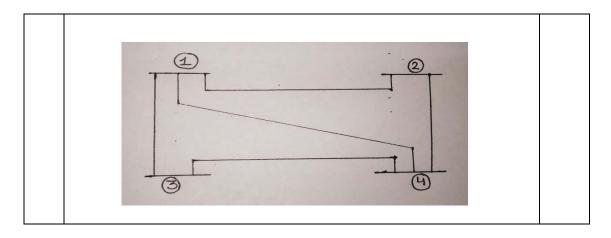
| Atten | npt any <i>one</i> part of the <b>f</b>            | following:             | 10 *  | *1 = 10 |
|-------|--|------------------------|---|---------|
| Qno   |  | Questions              | 17  | CO      |
| (a)   | Derive the static load f<br>number of buses and al |                        | er system network with n<br>ns for Pi and Qi. | 2       |
| (b)   | Form a Y-Bus for a giv                             | en network using direc | t inspection method.                          | 2       |
|       | Line   | R in P.U               | X in P.U                                      |         |
|       | 1-2  | 0.05                   | 0.15  |         |
|       | 1-3  | 0.10                   | 0.30  |         |
|       | 1-4  | 0.20                   | 0.40  |         |
|       | 2-4  | 0.10                   | 0.30  |         |
|       | 3-4  | 0.05                   | 0.15  |         |
|       |  | ·                      | ·   |         |

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### Attempt any one part of the following: 5.

| Attempt any <i>one</i> part of the following: 10*1 |   | 1 = 10 |   |
|--|---|--------|---|
| Qno  | Questions   | CO     |   |
| (a)  | Explain the expressions for reflection and refraction coefficients of voltage<br>and current waves for the following cases:<br>(i) Terminated through resistance<br>(ii) Through a open circuit end | 3      | 2 |
| (b)  | Explain the procedure for drawing Bewley's lattice diagram with the help of suitable example.   | 33.    |   |

#### 6. rt of the fall

| Atten | npt any <i>one</i> part of the following: 10*1                                   | 1 = 10 |
|-------|--|--------|
| Qno   | Questions  | CO     |
| (a)   | Derive the swing equation for a synchronous machine connected to an infinite     | 4      |
|       | bus and explain the steady state stability limit on the basis of swing equation. |        |
| (b)   | Explain the equal area criteria concept of power system stability when           | 4      |
|       | there is sudden increase in mechanical power.                                    |        |

### 7. Attempt any one part of the following:

|   | there is studien mercuse in mechanical power.   |    |  |
|---|---|----|--|
| Attempt any <i>one</i> part of the following: 10* |   |    |  |
| Qno   | Questions   | CO |  |
| (a)   | What is the objective of power system protection scheme?Explain differential protection relay used for the protection of power system network.                      | 5  |  |
| (b)   | Explain PSM of relay and find out the value of plug setting multiplier<br>for 50% and 100 % relay setting .The fault current is 2000 A, and CT<br>ratio is 400 : 5. | 5  |  |
|   |   |    |  |