Examination Roll No.....

**YMCA UNIVERSITY OF SCIENCE& TECHNOLOGY, FARIDABAD**

**B. TECH. 8th SEMESTER (UNDER CBS)**

**CAPS(EL-410)**

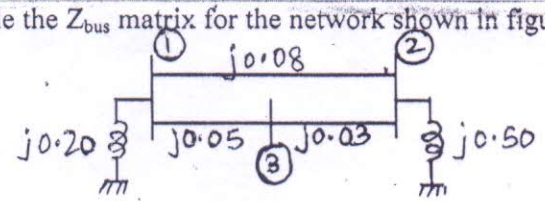
Time: 3 Hours | Max. Marks:60

*Note:*
1. *It is compulsory to answer the questions of Part -1. Limit your answers within 20-40 word in this part.*
2. *Answer any four questions from Part -2 in detail.*
3. *Different parts of the same question are to be attempted adjacent to each other.*
4. *Use of unmarked Steam tables, Mollier charts etc. is allowed.*
5. *Assume suitable standard data wherever required, if not given.*

## PART -1

| | | | |
|---|---|---|---|
| Q1 | (a) | What are various types of buses in load flow studies? | (2) |
| | (b) | State significance of positive and zero sequence components. | (2) |
| | (c) | Define short circuit capacity of a bus. | (2) |
| | (d) | Compare G-S & N-R method of load flow analysis. | (2) |
| | (e) | Define a primitive network. | (2) |
| | (f) | What do you mean by acceleration factor? | (2) |
| | (g) | What are the functions of an energy control centre? | (2) |
| | (h) | Explain RTU in brief. | (2) |
| | (i) | For a star-delta transformer with star grounded, draw zero sequence impedance diagram. | (2) |
| | (j) | What do you mean by a flat voltage start? | (2) |

## PART -2

| | | | |
|---|---|---|---|
| Q2 | (a) | A 3-phase, 37.5 MVA, 33kV alternator having $X_1$=0.18p.u and $X_0$=0.12p.u, $X_2$=0.15p.u based on its rating is connected to a 33kV overhead line having $X_1$=6.1Ω, $X_2$=5.3Ω and $X_0$=12.2Ω per phase. A single line to ground fault occurs at the remote end of a line. The alternator neutral is solidly grounded. Calculate the fault current. | (6) |
| | (b) | Derive the expression for three phase power in terms of symmetrical components. | (4) |
| Q3 | (a) | Write and algorithm and flow-chart for Newton-Raphson method of load flow analysis when the system contains all types of buses. | (10) |
| Q4 | (a) | Draw a diagram showing interconnection of sequence networks for a single line to ground fault. Derive the necessary equations for the sequence currents. | (6) |
| | (b) | In a three phase system the phase voltages are given by Va=300∠-120°, Vb=200∠90°, Vc=100∠30°. Obtain the symmetrical components for a set of given unbalanced voltages. | (4) |
| Q5 | (a) | Assemble the $Z_{bus}$ matrix for the network shown in figure.   | (6) |
| | (b) | Prove that in a bus admittance matrix, each diagonal element is equal to sum of all admittances connected at node i and off diagonal element is equal to negative of admittances connected between node i and j . | (4) |

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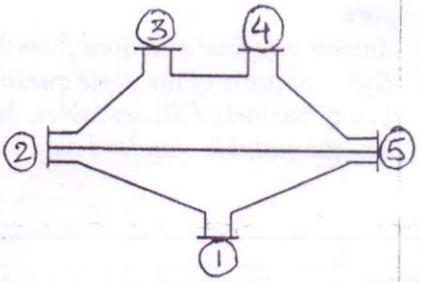
Q6 Figure shows a five bus power system. Each line has an admittance of (0.05+j0.15)p.u. The line shunt admittances may be neglected. The bus power and voltage specifications are given in the table: (10)

(a) Form $Y_{bus}$

(b) Find $Q_2$, $\delta_2$, $V_3$, $V_4$ and $V_5$ after the first iteration using Gauss Seidel method. Assume $Q_{2,min}$=0.2pu $Q_{2,max}$=0.6pu

| Bus | $P_L$ | $Q_L$ | $P_G$ | $Q_G$ | V | Bus specification |
|---|---|---|---|---|---|---|
| 1 | 1.0 | 0.5 | ? | ? | $1.02\angle 0^0$ | Slack bus |
| 2 | 0 | 0 | 2 | ? | 1.02 | PV bus |
| 3 | 0.5 | 0.2 | 0 | 0 | ? | PQ bus |
| 4 | 0.5 | 0.2 | 0 | 0 | ? | PQ bus |
| 5 | 0.5 | 0.2 | 0 | 0 | ? | PQ bus |




Q7 Write short notes on:

(a) SCADA and its applications (5)

(b) Various operating states of a power system (5)

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