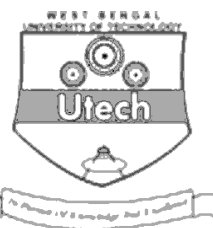


Invigilator's Signature :



iii) The operator 'a' is given by

- a) e^{j120° b) e^{-j120°
 c) e^{j60° d) e^{-j60° .

iv) With usual notation, which of the following is true for a decoupled model ?

- a) $\Delta P = [H] \Delta \delta$
 b) $\Delta Q = [L] \Delta \delta$
 c) $\Delta P = [M] \Delta |V|$
 d) $\Delta P = [M] \frac{\Delta |V|}{|V|}$.

v) The speed of fast decoupled load flow method when compared to Newton-Raphson method is

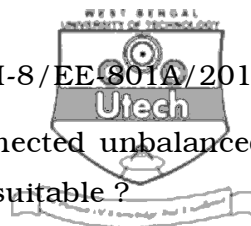
- a) very slow
 b) almost the same
 c) double the N-R method speed per iteration
 d) five times the N-R method speed per iteration.

vi) The number of iterations required for an n -bus system in Gauss-Seidel method is approximately

- a) n b) n^2
 c) 3 d) $\frac{n(n+1)}{2}$.

vii) In load flow studies, the state variables are

- a) P & Q b) $|V|$ & δ
 c) P & $|V|$ d) P & δ .



viii) For the solution of 3-phase star connected unbalanced load problem, which method is more suitable ?

- a) Symmetrical component
- b) Direct analysis
- c) Thevenin's theorem
- d) Milman's theorem.

ix) Which of the following is *true* ?

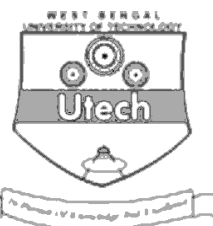
- a) Gauss-Seidel method is a direct solution method for power flow
- b) All iterative methods ensure convergence
- c) A generator bus is also called a swing bus
- d) If the reactive generation exceeds the limit, then the $P, |V|$ bus will become a P, Q bus.

x) All generators in a coherent group in load frequency control

- a) speed up individually
- b) slow down individually
- c) speed up & slow down together
- d) none of these.

xi) The rank of a graph (n is the no. of nodes in the graph) is

- a) n
- b) $n - 1$
- c) $n + 1$
- d) 0.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

2. Discuss briefly the bus classification.
3. Compare the Gauss-Seidel & Newton-Raphson methods for power flow solution.
4. Which method of load forecasting would you suggest for long term & why ?
5. Write a note on treatment of bad data in power system.
6. What is meant by optimal unit commitment ? Explain.

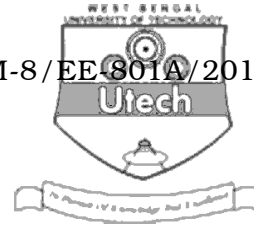
GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

7. A power system consists of 4 buses. Generators are connected at buses 1 2 3, reactances of which are $j\ 0.2$ & $j\ 0.1$ respectively. The transmission lines are connected between buses 1-2, 1-4, 2-3 & 3-4 & have reactances $j\ 0.25$, $j\ 0.5$, $j\ 0.4$ & $j\ 0.1$ respectively.



Find the bus admittance matrix —

- i) by direct inspection
- ii) using bus incidence matrix & admittance matrix.

8. a) Discuss Newton-Raphson method in general & explain its applicability for power flow solution.

b) Explain the principle of load frequency control (single area case) in power system.

7 + 8

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9. In the following figure, assume that

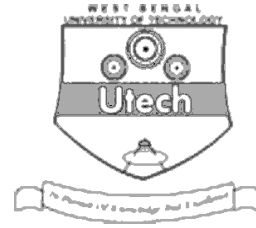
$$S_{D1} = 1.0, V_1 = 1 \angle 0^\circ, S_{D2} = 1.0 - j0.8$$

$$Q_{G2} = -0.3, S_{D3} = 1.0 + j0.6, P_{G2} = 0.8$$

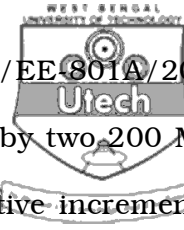
$$Z_2 = j0.4 \text{ all lines}$$

Use Gauss iteration to find V_2 & V_3 . Start with

V_2° & $V_3^\circ = 1 \angle 0^\circ$. Do one iteration only. Bus 2 is a P, Q bus.



10. a) What is meant by economic despatch in power system ?



- b) A constant load of 300 MW is supplied by two 200 MW generators, 1 & 2 for which the respective incremental fuel costs are

$$\frac{dC_1}{dP_{G_1}} = 0.1 P_{G_1} + 20$$

$$\frac{dC_2}{dP_{G_2}} = 0.12 P_{G_2} + 15$$

with powers P_G in MW & costs C in Rs./hr. Determine –

- i) the most economical division of load between the generators
- ii) the saving in Rs./day thereby obtained to equal load sharing between machines. 5 + 10

11. Write short notes on any *three* of the following : 3 × 5

- a) Data acquisition system
- b) Hydrothermal scheduling
- c) Static state estimation
- d) Active & reactive power optimization.

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