

Enroll No

Q.P. Code
M127

Mid-Sem Exam (MSE) (2025-26)

Final Year B.Tech. Electrical

Course Code: EE429

Course Name: Power System Operation and Control

Day & Date: Thursday 18/08/2025

Time: 3:15 To 5:15

Max Marks- 50

- Instructions:**
- 1) All questions are compulsory.
 - 2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas, figures in the first right column indicate total marks for that whole question.
 - 3) CO is the index number of the Course Outcome statement.
 - 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
 - 5) Assume suitable data if necessary.
 - 6) Use of non-programmable calculators is allowed

- | | Marks | BT Level | COs |
|---|-------|----------|-----|
| Q.1 A Consider two units of a plant that have fuel costs of
$F_1 = 0.3P_1^2 + 40P_1 + 120 \text{ Rs./h}$
$F_2 = 0.35P_2^2 + 30P_2 + 150 \text{ Rs./h}$
Determine the economic operating schedule (4M) and the corresponding cost of generation (4M) for the demand of 180 MW and compute savings obtained by loading the units optimally, if the load is equally shared by both the units. | 08 | 3 | 1 |
| B Derive the expression of the modified coordination equation (8M) for economic load dispatch with transmission losses. | 08 | 3 | 1 |
| Q.2 A Determine the Y_{bus} for the five-bus system (8M) shown in Fig. 2a. Assume the shunt admittances at the lines are neglected. | 08 | 2 | 2 |

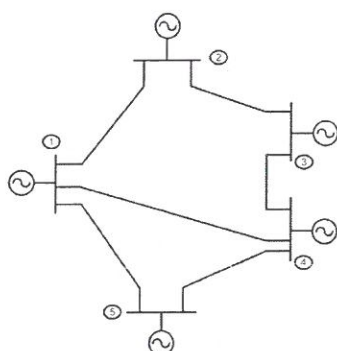


Fig. 2a 5-bus system

Sr. No	Line (bus to bus)	Impedance
1	1-2	$j0.2$
2	2-3	$j0.25$
3	3-4	$j0.3$
4	4-5	$j0.25$
5	1-5	$j0.2$
6	1-4	$j0.5$

- | | | | |
|---|----|---|---|
| B A three-bus power system is shown in Fig. 2b. The relevant per unit line admittances on 100 MVA base are indicated on the diagram and bus data are given in Table 2b. Form the Y_{bus} and compute (9M) the | 09 | 4 | 2 |
|---|----|---|---|



voltages at bus 2 and 3 after the first iteration using *Gauss-Seidel* method. Take the acceleration factor $\alpha=1.6$.

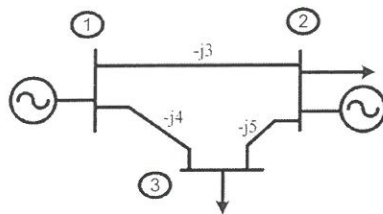


Fig. 2b A 3-bus system power system

Table 2b. Bus Data

Bus Number	Type	Generation		Load		Bus Voltage	
		P_G (MW)	Q_G (MVar)	P_L (MW)	Q_L (MVar)	V pu	δ deg
1	Slack	?	?	0	0	1.02	0^0
2	PQ	25	15	56	25	?	?
3	PQ	0	0	60	30	?	?

OR

A three –bus power system is shown in Fig. 2b. The relevant per unit line admittances on 100 MVA base are indicated on the diagram and bus data are given in Table 2b. Form the Y_{bus} and compute (9M) the voltages at bus 2 and 3 after the first iteration using *Newton Raphson* method. Take the acceleration factor $\alpha=1.6$.

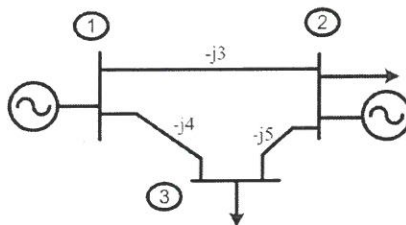


Fig. 2b A 3-bus system power system

Table 2b. Bus Data

Bus Number	Type	Generation		Load		Bus Voltage	
		P_G (MW)	Q_G (MVar)	P_L (MW)	Q_L (MVar)	V pu	δ deg
1	Slack	?	?	0	0	1.02	0^0
2	PQ	25	15	56	25	?	?
3	PQ	0	0	60	30	?	?

- Q.3 A Derive the balance equation for small load changes (8M) with the help of load frequency control of an isolated power system . 08 3 3
- B With a neat block diagram (2M) explain the working principle of a speed governing system (7M). 09 3 3

