(REVISED COURSE)

(3 Hours) [Total Marks : 100

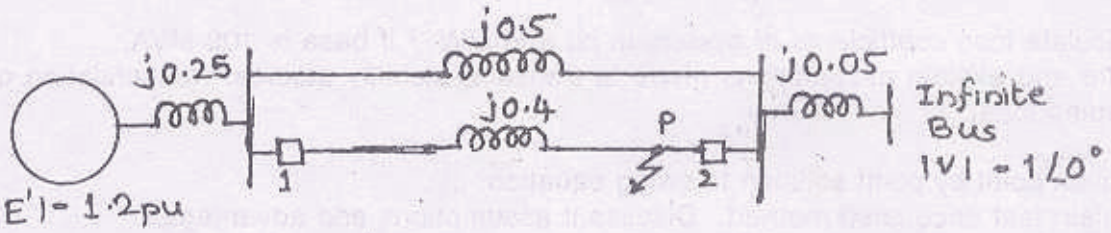
N.B. (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions out of remaining.
(3) Assume data if **necessary** and justify the **same**.

1. (a) Explain economic load distribution between the plants taking tansmission line loss in to account. Explain penalty factor. 10
(b) In a two bus sysem, if 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when system λ is Rs. 25 per MWh. 10
The IFCs of the two plants are as follows :

$$\frac{dc_1}{dP_{G_1}} = 0{\cdot}02\ P_{G1} + 16{\cdot}0 \quad \text{Rs./MWh}$$

$$\frac{dc_2}{dP_{G_2}} = 0{\cdot}04\ P_{G2} + 20{\cdot}0 \quad \text{Rs/MWh}$$

2. (a) Explain equal area criterion to determine stability of a system. 10
(b) For a system shown in the diagram, a three phase fault is applied at the point P as shown. Find the critical clearing angle for clearing the fault with simultaneous opening of brakers 1 and 2. The generator is delivering 1·0 pu power at the instant preceding the fault. 10



3. (a) Write an algorithm for Gauss-Seidel method for load flow analysis when all buses present are PQ buses. 10
(b) For a four bus system, following data is known : 10

$$Y_{BUS} = \begin{bmatrix} 3-j9 & -2+j6 & -1+j3 & 0 \\ -2+j6 & 3{\cdot}67-j11 & -0{\cdot}67+j2 & -1+j3 \\ -1+j3 & -0{\cdot}67+j2 & 3{\cdot}67-j11 & -2+j6 \\ 0 & -1+j3 & -2+j6 & 3-j9 \end{bmatrix}$$

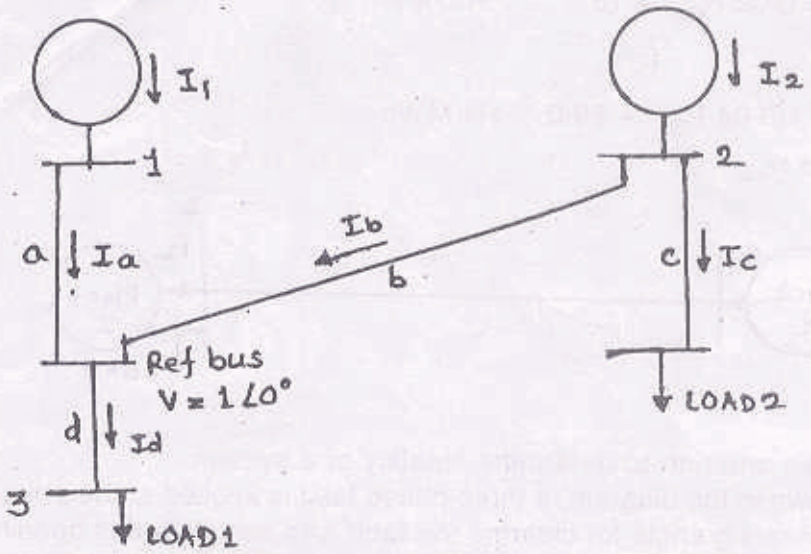
Bus	P_i pu	$Q_{i\ pu}$	$V_{i\ pu}$	Remarks
1	—	—	$1{\cdot}04 \angle 0°$	slack
2	0·5	—	1·4	PV
3	− 1·0	0·5	—	PQ
4	0·3	− 0·1	—	PQ

4. (a) Draw the complete block diagram of load frequency control of an isolated power system and explain its steady state analysis. 12
   (b) Draw the composite block diagram of two area load frequency control. 8

5. (a) Explain quality and its parameters. Discuss sources and effects of harmonics. 10
   (b) Explain necessity of slack bus and compare GS and NR methods for load flow. 10

6. (a) **Figure** shows a system having two plants 1 and 2 connected to buses 1 and 2 respectively. 10
   The branch currents and impedances are :

   $I_a = 2 - j0{\cdot}5$ pu $I_b = 1{\cdot}6 - j0{\cdot}4$ pu
   $I_c = 1{\cdot}0 - j0{\cdot}25$ pu $I_d = 3{\cdot}6 - j0{\cdot}9$ pu
   $Z_a = 0{\cdot}015 + j0{\cdot}06$ pu $Z_b = 0{\cdot}015 + j0{\cdot}06$ pu
   $Z_c = 0{\cdot}01 + j0{\cdot}04$ pu $Z_d = 0{\cdot}01 + j0{\cdot}04$ pu



   Calculate loss coefficients of system in pu and MW^{-1} if base is 100 MVA.
   (b) State and explain assumptions made in transient stability studies. (Justification of all assumptions). 10

7. (a) Explain point by point solution to swing equation. 10
   (b) Explain fast decoupled method. Discuss it assumptions and advantages. 10
