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) Derive condition for economic load dispatch neglecting transmission line losses. 10

(b) A const load of 300 MW is supplied by two 200 MW generators for which respective IFCs are 10

$$\frac{dc_1}{dp_{G1}} = 0.1\,p_{G1} + 20 \qquad \frac{dc_2}{dp_{G2}} = 0.12\,p_{G2} + 15$$

with P_G in watts and c in Rs/hr.

Find most economic division of load between generators. Also find saving in Rs/day thereby obtained compared to equal load sharing.

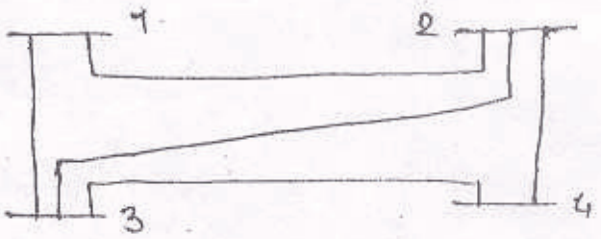
2. (a) Explain equal area criterion to determine stability of the system for sudden change in mechanical input. 10

(b) State and explain assumptions made in transient stability. 10

3. (a) A 100 MVA, 11 KV, 16 pole, 50 Hz water wheel generator has an inertia constant of 3 MJ/MVA 10
(i) Find energy stored in the rotor at synchronous speed (ii) The machine operating at a load of 50 MW when load suddenly increased to 80 MW. Find rotor retardation. Neglect losses (iii) The rotor retardation calculated above is maintained for 5 cycles. Find change in power angle and speed in rpm during this period.

(b) Explain control of voltage profile. 10

4. For a one line diagram of a simple four bus system, Calculate Y_{Bus}. 20



Line, Bus to Bus	R	X
1–2	0.05	0.15
1–3	0.1	0.3
2–3	0.15	0.45
2–4	0.1	0.3
3–4	0.05	0.15

If input data is as follows, find voltages and corresponding angles of all the buses by GS method at the end of 1st iteration.

Bus	P_i	Q_i	V_i	Remarks
1	–	–	$1.04\angle 0$	slack
2	0.5	– 0.2	–	PQ
3	–1.0	0.5	–	PQ
4	0.3	–	–	PQ

5. (a) Derive expression for transmission loss in terms of generation. 10

(b) Explain the effect of clearing time on stability. 10

6. (a) Explain in brief working of turbine governing system used for load frequency control of a single area system and hence derive model of speed governor system. 12

(b) Draw and explain automatic voltage regulator of generator. 8

7. (a) Explain sources and effects of harmonics. 10