Ref. No. : Ex/PG/PE/T/129F/2024

MASTER OF POWER ENGG. EXAMINATION, 2024
(2nd SEMESTER)

POWER SYSTEM PLANNING AND OPERATION

TIME: THREE HOURS **FULL MARKS: 100**

Answer any five questions

1. a) Describe briefly about spinning reserve. 6
b) Explain the following terms:
(i) valve-point effect (ii) ramp rate limit constraints (iii) transitional cost (iv) minimum up time and minimum down time 4+4+3+3

2) Explain the following terms:
(i) pumped storage hydro plants (ii) run-of-river plants (iii) controllable hydro plants
(iv) hydro system 5+5+5+5

3. a) What is load forecasting? 4
b) Describe short-term load forecasting and long-term load forecasting. 16

4) Describe different objective functions and constraints of optimal power flow. 20

5) describe briefly about power system planning. 20

6) Given the following steam-plant and hydro plant characteristics: 20

Steam plant:

Incremental fuel cost = $2.0 + 0.002P_S$ Rs/MWh and $100MW \le P_S \le 500MW$

Hydro plant:

Incremental water rate = $50 + 0.02P_H$ ft^2 /sec/ MW and $0 \le P_H \le 500\,MW$

[Turn over

Table: Load demand:

Time period	P_{Load} (MW)
1400-0900	350
0900-1800	700
1800-2400	350

Assume (i) The water input for $P_H = 0$ may also be assumed to be zero, that is $q(P_H) = 0$ for $P_H = 0$, (ii) Neglect losses (iii) Thermal plant remains on-line for 24-h period.

Find the optimum schedule of P_S and P_H over the 24-h period that meets the restriction that the total water used is 1250 million ft^3 of water that is

$$q_{Total} = 1.25 \times 10^9 \text{ ft}^3$$