

Code No: **R41024**
**R10**
**Set No. 1**
**IV B.Tech I Semester Supplementary Examinations, Oct/Nov - 2018**
**POWER SYSTEM OPERATION AND CONTROL**

(Electrical and Electronics Engineering)

**Time: 3 hours**
**Max. Marks: 75**

**Answer any FIVE Questions**  
**All Questions carry equal marks**  
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- 1 a) Explain the importance characteristics of a steam unit. [8]  
 b) The fuel cost of two units are given by

$$C_1 = C_1(P_{G1}) = 1.0 + 25 P_{G1} + 0.2 P_{G1}^2 \quad \text{Rs/h}$$

$$C_2 = C_2(P_{G2}) = 1.5 + 35 P_{G2} + 0.2 P_{G2}^2 \quad \text{Rs/h}$$

If the total demand on the generators is 200MW, find the economic load scheduling of the two units. [7]

- 2 a) Derive the transmission loss formula and state the assumptions made in it [8]  
 b) A system consisting of two generating plants with fuel costs of

$$C_1 = 0.05 P_{G1}^2 + 20 P_{G1} + 1.5 \quad \text{Rs/h}$$

$$C_2 = 0.075 P_{G2}^2 + 22.5 P_{G2} + 1.6 \quad \text{Rs/h}$$

The system is operating on economical dispatch with 100 MW of power generation by each plant. The incremental transmission loss of plant-2 is 0.2. Find the penalty factor of plant-1. [7]

- 3 a) Discuss about the importance of hydro-thermal Co-ordination with an example. [8]  
 b) A two plant system having a thermal station near the load center and a hydro power station at remote location. The characteristics of both stations are

$$C_1 = (20 + 0.03) P_{GT} P_{GT} \quad \text{Rs/h}$$

$$W_2 = (8 + 0.002 P_{GH}) P_{GH} \quad \text{m}^3/\text{sec}$$

$$\& \quad \gamma_2 = 5 \times 10^{-4} \text{ Rs./m}^3\text{-h}$$

$$\text{The transmission loss co-efficient } \beta_{22} = 0.0005 \text{ MW}^{-1}$$

Determine the power generation at each station and the power received by the load when  $\lambda = 50 \text{ Rs / MWh}$ . [7]

- 4 A power system network with thermal power plant is operating by three number of generating units. Determine the most economical units to be committed to a load demand of 6 MW. The minimum and maximum generating capacities and cost curve parameters of the units listed in tabular form as given below.

Unit number	Capacity (MW)		Cost curve parameters		
	Min	Max	a	b	d
1	1.0	12.0	0.77	23.5	0
2	1.0	12.0	1.60	26.5	0
3	1.0	12.0	2.00	30.0	0

[15]

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- 5 a) How do the governor characteristics of the prime mover affect the control of system frequency and system load? [8]  
b) A 150 MVA, 50 Hz turbo alternator operates at no load at 3,000 rpm. A load of 30 MW is suddenly applied to the machine and the steam valves to the turbine commence to open after 0.5 sec. due to the time lag in the governor system. Assuming inertia constant  $H = 4.75$  kW sec per kVA of generator capacity, determine the frequency to which the generated voltage drops before the steam flow commences to increase to meet the new load. [7]
- 6 Obtain the block diagram of a two area system by deriving necessary expressions. [15]
- 7 For a single area system, show that the static error in frequency can be reduced to zero using frequency control and comment on the dynamic response of an uncontrolled system with necessary equations. [15]
- 8 a) What do you mean by load compensation? Explain about the shunt compensation. [8]  
b) Explain the need of FACTS devices in transmission systems. [7]