Code No: **R41024** **R10** **Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015

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 Explain the different constraints in economic operation of power system.

2 In a three plant system the cost functions are given by $F_1(P_1) = 500 + 7P_1 + 0.002P_1^2$; $F_2(P_2) = 400 + 6.5P_2 + 0.003P_2^2$; $F_3(P_3) = 200 + 7.2P_3 + 0.006P_3^2$ and the transmission loss is expressed as $P_l = 0.00002P_1^2 + 0.00005P_2^2 + 0.006P_3^2$ assuming total load to be 900 MW find the economic dispatch schedule.

3 a) How do you justify cost of water in long term and short term hydro thermal scheduling explains clearly?

b) In a combined system one thermal plant and one hydro plant the total load is consist of 90 MW for a month of 30 days find the running time of thermal plant if the maximum hydro energy is 50000 MW hr. the cost function of thermal plant is given by $F_C = 54 + 11P_{th} + 0.002P_{th}^2$ unit of cost / hr.

4 a) What is meant by unit commitment problem? Explain the need for UC problem in operation of power system.

b) Explain the priority list scheme method for UC and develop algorithm for simple shut down sequence

5 a) Obtain the alternator model of ALFC?

b) Explain the functional operation of speed governing system with neat sketch.

6 Draw the block diagram for a two-area LFC with integral controller blocks and explain each block.

7 Find the nature of dynamic response if the two areas of the above problem are of uncontrolled type, following a disturbance in either area in the form of a step change in an electric load. The inertia constant of the system is given as H = 2 s and assume that the tie line has a capacity of 0.08 p.u. and is operating at a power angle of 35^o before the step change in load.

8 Compare the different types of compensating equipment for transmission systems.

Code No: **R41024** **R10** **Set No. 2**

IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015

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 Derive the expression for economic operation of power system by neglecting line losses also develops the algorithm for the solution of problem.

2 a) Explain the method for economic plant load scheduling.
b) Explain about penalty factor and incremental transmission loss.

3 a) Explain analytical method for scheduling of hydro plants in cascade.
b) The fuel cost characteristics of two generators of a system is $F_{C1}(P_{C1}) = 20P_{G1}^2 + 175P_{G1} + 50\cos t/hr$; $F_{C2}(P_{C2}) = 30P_{G2}^2 + 180P_{G2} + 40\cos t/hr$ where P_{G1} and P_{G2} are in p.u on 100 MVA base determine economic generation schedule to supply a load of 0.55 p.u using Newton raphson method.

$$[B] = \begin{bmatrix} 0.007 & 0.0002 & 0.0006 \\ 0.0002 & 0.0006 & 0.0005 \\ 0.0006 & 0.0005 & 0.0000042 \end{bmatrix} p.u$$

4 a) Discuss the different constraints on Unit Commitment problem.
b) Explain the procedural approach for the solution of an optimal UC problem with dynamic programming method.

5 a) Explain the primary ALFC loop with neat diagram.
b) A sub grid has a total rated capacity of 3000MW it encounters a load increase of 40 MW when the normal operating load is 2000 MW assume inertia constant H to be 5 sec and regulations of generators in the system as 3Hz/p.u MW find ALFC parameters, static frequency drop and transient response. Assume load frequency dependency to be linear

6 What are the differences between uncontrolled, controlled, and tie-line bias LFC of a two-area system.

7 Two interconnected areas 1 and 2 have the capacity of 250 and 600 MW, respectively. The incremental regulation and damping torque coefficient for each area on its own base are 0.3 and 0.07 p.u. respectively. Find the steady-state change in system frequency from a nominal frequency of 50 Hz and the change in steady-state tie-line power following a 850 MW change in the load of Area-1.

8 Explain the effects on uncompensated line under no-load and load conditions.

Code No: **R41024** **R10** **Set No. 3**

IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015

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 Obtain the economic operation schedule for three thermal units delivering a total load of 750 MW by considering with and without generator limits.

Unit 1: P_{max}=600 MW P_{min}=150 MW $F_1(P_1) = 570 + 7.5P_1 + 0.0017P_1^2\ Rs/hr$

Unit2: P_{max}=500 MW P_{min}=125 MW $F_2(P_2) = 380 + 7.8P_2 + 0.002P_2^2\ Rs/hr$

Unit:3 P_{max}=500 MW P_{min}=125 MW $F_3(P_3) = 200 + 7.9P_3 + 0.005P_3^2\ Rs/hr$

2 Derive the expression for economic operation of power system by considering the line losses also develop the algorithm for the solution of problem.

3 a) Explain analytically hydro thermal scheduling of pumped storage plant.

b) Obtain a flow chart to find short term hydro thermal scheduling considering line losses for cascade in classical method.

4 A power system network with a thermal power plant is operating by four generating units determine the most economical unit to be committed to a load of 8MW also prepare the UC table for the load changes in step of 1 MW starting from the minimum to maximum load . The minimum and maximum generating capacities and cost curve parameters of the units listed from the following table.

UNIT NO	CAPACITIES (MW)		COSTCURVE PARAMETERS		
	Min	Max	a	b	c
1	1.0	14.0	0.74	22.9	0
2	1.0	14.0	1.56	25.9	0
3	1.0	14.0	1.97	29.0	0
4	1.0	14.0	1.36	31.2	0

5 a) What are the different turbine representations in ALFC?

b) Explain the static performance of AVR loop?

6 Derive the expression for incremental tie-line power of an area in an uncontrolled two-area system under dynamic state for a step-load change in either area.

7 Two control areas of 1,500 and 2,500 MW capacities are interconnected by a tie line. The speed regulations of the two areas, respectively, are 3 and 1.5 Hz/p.u. MW. Consider that a 2% change in load occurs for a 2% change in frequency in each area. Find the steady-state change in the frequency and the tie-line power of 20 MW change in load occurring in both areas.

8 a) Explain the objectives of load compensation

b) A 3-ϕ, 5 kW induction motor has a p.f. of 0.8 lag. A bank of capacitors is connected in delta across the supply terminals and p.f. is raised to 0.95 lag. Determine the kVAr rating of the capacitors connected in each phase.

Code No: **R41024** **R10** **Set No. 4**

IV B.Tech I Semester Regular/Supplementary Examinations, Nov/Dec - 2015

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) Distinguish between the input and output operational characteristics of thermal plant and hydeal plant.

b) With a neat sketch explain Incremental fuel rate and incremental fuel cost curves.

2 Incremental fuel costs of a two plant system are given by $\lambda_1 = 0.005P_1 + 12 Rs/MWhr$ $\lambda_2 = 0.009P_2 + 10 Rs/MWhr$ Where P_1 and P_2 are in MW assuming the load to be 500 MW find economic schedule incremental transmission loss and penalty factor for the system. The [B] matrix is given by $[B] = \begin{bmatrix} 4.682 & -0.0412 & 0.231 \\ -0.0412 & 4.529 & 0.154 \\ 0.231 & 0.154 & 0.095 \end{bmatrix} \times 10^{-3}$ [B] matrix is in p.u on 100 MVA base.

3 Derive the expression for economic operating criterion of hydro thermal system by considering losses of network.

4 a) Derive the condition for optimality of short-term hydro-thermal scheduling Problem.

b) What are the advantages of hydro-thermal plants combinations?

5 a) Obtain the steady state performance of the speed governing system for inter connected systems.

b) A 100 MW unit with 0.05 p.u turbine regulation operates in parallel with a 500 MW unit of identical turbine regulation for a specific amount of power demand increase. Find the ratio of sharing of the load by the units if the system frequency is 50 HZ.

6 a) Explain about the optimal two-area LFC.

b) What is meant by tie-line bias control?

7 a) Explain the combined operation of an LFC and an ELDC system.

b) Explain the method involved in optimum parameter adjustment for a two-area system.

8 a) What are the specifications of load compensation?

b) A 3-ϕ, 50 Hz, 3,000 V motor develops 600 HP, the p.f. being 0.75 lagging and the efficiency 0.95. A bank of capacitors is connected in delta across the supply terminals and the p.f. raised to 0.98 lagging. Each of the capacitance units is built of five similar 600 V capacitors. Determine the capacitance of each capacitor.