Total No. of Questions : 8]

SEAT No. :

P567

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[6004]-503

B.E.(Electrical Engineering)

POWER SYSTEM OPERATION AND CONTROL

(2019 Pattern) (Semester - VII) (403141)

Time : 2.30 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2,Q.3 or Q.4,Q.5 or Q.6 and Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagram must be drawn wherever neccesary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of a non-programmable calculator is allowed.***

Q1) a) Explain the necessity of maintaining frequency constant. **[4]**

b) Explain the droop characteristics of the speed governor system. **[6]**

c) Explain the working of proportional plus integral load frequency control of an isolated power system along with its frequency response curve. **[8]**

OR

Q2) a) Draw the complete block diagram of single area load frequency control. **[4]**

b) Explain the necessity of automatic generation control (AGC). Also, explain the concept of area control error (ACE) of a single area and two area case. **[6]**

c) With the neat block diagram, explain two area of load frequency control. **[8]**

Q3) a) Define the terms related to the constraints of the Unit Commitment: **[4]**

i) Crew Constraints

ii) Minimum uptime

iii) Minimum downtime

iv) Spinning reserve

P.T.O.

b) State the various methods for the unit commitment. Hence, explain the 'priority list method' for unit commitment. **[5]**

c) Explain with the mathematical formulation, the Lagrange Multiplier method of economic load dispatch with transmission loss and no constraints of generation limit while meeting the load. **[8]**

OR

Q4) a) What is the need for a unit commitment study in the power system? Explain. **[4]**

b) Write a short note on: **[5]**

i) Heat rate curve of a thermal generating unit.

ii) Cost curve of a thermal generating unit.

c) Using the priority list method prepare a unit commitment table using three generating units, for load values such as 400MW, 900MW, and 1100MW.The incremental fuel cost of three units and other details are as follows: **[8]**

$$(IC)_1 = (0.003P_1 + 8)*10^3 \text{ Kcal/MWhr}$$

$$(IC)_2 = (0.002P_2 + 8.5)*10^3 \text{ Kcal/MWhr}$$

$$(IC)_3 = (0.004P_3 + 9)*10^3 \text{ Kcal/MWhr}$$

Maximum and minimum generation limits are,

$50<P_1<500$ MW; $40<P_2<400$ MW; $20<P_3<200$ MW

The fuel cost is $(CP)_1$ = 1.1 Rs / Kcal, $(CP)_2$ = 1.05Rs / kcal, $(CP)_3$ = 1.25Rs / kcal.

Q5) a) What is the need for interconnection of the power system? **[4]**

b) Explain in detail: Interchange evaluation with unit commitment. **[4]**

c) With an example explain the economic interchange between interconncted utilities. **[10]**

OR

Q6) a) What do you mean by power pool? What is the role of the power pool in energy control? **[6]**

b) Write a short note on: Capacity Interchange, diversity interchange. **[6]**

c) Explain: **[6]**

i) Energy Banking.

ii) Emergency Power Interchange.

Q7) a) State the procedure to draw the QV curve. Hence, draw the QV curve with appropriate labeling showing stable-unstable regions. **[4]**

b) What are the effects of voltage instability on the power system? Explain in detail. **[6]**

c) Derive the expression of the power-voltage relationship for drawing the PV curve in detail and hence draw the PV curve with appropriate labeling showing stable-unstable region. **[7]**

OR

Q8) a) What is the use of the PV curve in voltage stability analysis? State the drawbacks associated with the PV curve method. **[4]**

b) Write a short note on load characteristics in the voltage stability. **[6]**

c) What is the concept of voltage collapse in the power system? What are the causes of voltage collapse? **[7]**