

Total No. of Questions : 10]

SEAT No. :

**P1967**

[Total No. of Pages : 3

**[4859]-1025**

**B.E. (Semester - I)**

**ELECTRICAL ENGINEERING**

**Power System Operation & Control**

**(2012 Course)**

*Time : 2½ Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Attempt Q.1. or Q.2, Q.3 or Q.4, Q.5. or Q.6, Q.7. or Q.8, Q.9 or Q.10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of pocket calculator is allowed.*
- 5) *Assume suitable data if necessary.*

**Q1)** Obtain the expression for critical clearing angle, when the short circuit takes place at the middle of the one of the lines in power system. **[10]**

OR

**Q2)** Sketch and explain the loading capability of synchronous generator. Also state the constraint for generation of lagging and leading MVAR. **[10]**

**Q3)** Write short note on following **[10]**

- a) Steady state stability limit
- b) Reactive Power Management
- c) Advantages of FACTS

OR

**Q4)** a) With neat connection diagram, Explain TCR and FC type shunt compensation. **[5]**

- b) Explain the advantages of series compensation. Also state the location of capacitors used in the series compensation. **[5]**

**P.T.O.**

- Q5) a)** Write short note on three of the following : **[8]**
- i) Necessity of Automatic Generation control (AGC)
  - ii) Area control error (ACE) in load frequency control of single area case and two area case.
  - iii) Droop Characteristic of speed governor of generator.
- b) Explain with block diagram and frequency response, proportional plus integral load frequency control of single area case. **[8]**

OR

- Q6) a)** With neat block diagram and response, explain two area load frequency control. Draw frequency response and deviation in tie line power for change in load demand of any one area. **[10]**
- b) Explain the benefits of following : **[6]**
- i) Proportional plus integral load frequency control over only proportional load frequency control.
  - ii) Free governor mode of operation.

- Q7) a)** Define Unit commitment and Economic load dispatch. Explain the necessity of these tasks. **[4]**
- b) Explain the concept of cost curve of thermal unit. **[4]**
- c) Explain with mathematical formulation, Lagrange multiplier method of economic load dispatch without transmission loss and no constraint of generation limit, while meeting load. **[10]**

OR

- Q8) a)** Explain with suitable numerical, the solution to recursive function of dynamic programming of Unit Commitment. **[10]**
- b) Calculate the load sharing between following two thermal generating units. The incremental fuel cost equations are as follows ;
- $$IC1 = 0.20 * P1 + 40$$
- $$IC2 = 0.22 * P2 + 30$$
- Under optimum load dispatch condition, considering  $IC1 = IC2 = \lambda$ ; calculate the load sharing between two thermal generating units for following values. Also calculate total power generated by two generators at each value of  $\lambda$ .
- $\lambda = 45, 50, 55, 60$
- Plot the graph of ' $\lambda$ ' verses 'total generated - power' and 'total generated power' verses 'individual generation'. **[8]**

- Q9)** a) What is the Capacity interchange and Diversity interchange type of power interchange? [8]
- b) With Mathematical formula, explain the following Reliability indices. [8]
- i) SAIFI
  - ii) SAIDI
  - iii) CAIDI
  - iv) AENS

OR

- Q10)** a) Explain the conditions under which following mode of power transaction can happen [8]
- i) Emergency power interchange
  - ii) Inadvertent power exchange
- b) With Mathematical formula, explain the reliability indices evaluation for; [8]
- i) Series (Radial) System
  - ii) Parallel System.

