MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EE-703A

PUID : 07281 (To be mentioned in the main answer script)

POWER SYSTEMS-III

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Which of the following is correct ?
   a) Load factor = capacity factor × utilization factor
   b) Utilization factor = capacity factor × load factor
   c) Capacity factor = load factor / utilization factor
   d) Capacity factor = load factor × utilization factor.

ii) The coefficient of reflection for current for an open ended line is
   a) 1·0 b) 0·5
   c) – 1·0 d) 0.

http://www.makaut.com

iii) For a generating plant
   a) The utilization factor is always less than 1
   b) The utilization factor is always more than 1
   c) The utilization factor may be more may be less than 1
   d) The utilization factor and load factor are always equal.

iv) The long term load forecast is needed for
   a) Planning the addition in generation capacity
   b) Operation of the plant
   c) Planning the addition in generation capacity as well as operation of the plant
   d) Economic operation of the plant.

v) The power which must be available even under emergency conditions is known as
   a) Spinning reserve b) Cold reserve
   c) Firm power d) Hot reserve.

vi) The unit for incremental cost is
   a) Rs./MWh b) Rs./MW
   c) Rs. d) Rs./Hour.

vii) The principle of incremental cost is used
   a) To decide the total plant capacity to be operated
   b) To decide the load allocation between units in operation
   c) To decide the sequence of adding units
   d) All of these.

http://www.makaut.com

viii) Earth wire on overhead transmission line is provided to protect the line against

a) Lightning surge

b) Switching surge

c) Excessive fault voltages

d) Corona effect.

ix) Shunt compensation in an EHV is resorted to

a) Improve the stability

b) Reduce the fault level

c) Improve the voltage profile

d) As a substitute for synchronous phase modifier.

x) The advantage of Hydro plant is

a) Low operating cost

b) They can be started and loaded very quickly

c) They can be used as base load plants as well as peak load plants

d) All of these.

xi) A power system needs injection of VARs

a) At peak load

b) At off peak load

c) Both at peak load and off peak load

d) When the load is neither too high nor too low.

xii) The changes of reactive power at a bus have a great effect on the voltage magnitude

a) Of that bus b) Of distant buses

c) Of all the buses d) None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is incremental cost criterion ? How the incremental cost calculated ?

3. What are power system transients ? Discuss the sources of over-voltages in power system.

4. Explain reflection coefficient, surge impedance and surge impedance loading.

5. State the advantages of static VAR compensation systems over other methods of voltage control.

6. Discuss how shunt reactors are used for voltage control in a power system bus.

7. Explain the phenomena of lightning and the Travelling waves caused by it on transmission lines.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. a) Obtain the economic operation schedule for the three thermal units delivering a total load of 750 MW without considering generator limit and network losses. The given data for the units are as under :

Unit 1 : $F_1(P_1) = 570 + 7.5P_1 + 0.0017P_1^2$ Rs/hr.

Unit 2 : $F_2(P_2) = 380 + 7.8P_2 + 0.002P_2^2$ Rs/hr.

Unit 3 : $F_3(P_3) = 200 + 7.9P_3 + 0.005P_3^2$ Rs/hr.

b) What do you mean by (i) penalty factor and (ii) incremental transmission loss ? Explain. 8 + 7

http://www.makaut.com

9. a) Develop a simple computer approach for solving the economic dispatch problem.

b) 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 $P_l = 0.00002P_1^2 + 0.00005P_2^2 + 0.0001P_3^2$.

Assuming total load to be 900 MW. Find the economic dispatch schedule. 8 + 7

10. What is passive compensation ? Compare series and shunt compensators. Write short notes on SVC and STATCOM. 3 + 4 + 8

11. Describe different types of surge protection devices.

http://www.makaut.com

12 What is Hydro-Thermal Scheduling ? What do you mean by long term and short term hydro-thermal scheduling ? How do you justify for the cost of water ?

13. Write short notes on any *there* of the following : 3 × 5

a) Necessity of restructuring in electricity market

b) FACTS

c) Reactive power and voltage control

d) Transients in power system

e) Environmental aspects and electric power generation.