Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (EE)/SEM-7/EE-704C/2012-13

2012

POWER GENERATION ECONOMICS

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 the following : $10 \times 1 = 10$

   i) Load factor for a peak load plant is
      a) 0 b) 1
      c) low d) high.

   ii) Hydel power plant can be used as
      a) peak load plant b) base load plant
      c) both (a) and (b) d) none of these.

   iii) Load flow solution is done to calculate
      a) generated power by slack bus
      b) system parameter
      c) bus voltage & active power loss
      d) bus voltage & phase angle of each and every bus.

   iv) Demand factor is
      a) always greater than 1
      b) always less than 1
      c) of any value
      d) depends upon the system.

v) Efficiency of a thermal power plant is
   a) 40% b) 60%
   c) 80% d) 30%.

vi) Running cost is high for ..... power plant.
   a) thermal b) hydel
   c) nuclear d) non-conventional.

vii) Initial cost is higher for ..... power plant.
   a) thermal b) hydel
   c) nuclear d) diesel.

viii) Diversity factor ..... is good for power generation economics.
   a) less than 1 b) greater than 1
   c) zero d) equals to 1

ix) In load duration curve loads are arranged in
   a) ascending order
   b) descending order
   c) any order
   d) a way that depends upon the load curve.

x) State estimation is done to know
   a) best estimate of voltage magnitude and phase angle of each and every bus
   b) economic dispatch solution
   c) system power loss
   d) load flow solution.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Discuss the economic justification of the thermal power plants.
3. Discuss the various types of Unit Commitment method.

4. Define the terms 'load factor' and 'diversity factor' and explain the economic implication of these factors on the cost of energy generation.
5. Develop a simple Computational method in economic load scheduling.
6. Write down about the different load forecasting techniques.

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain 'Flow only algorithm' with required equations.

   b) Estimate two values random variables x by weighted LSE method for

$$W = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0{\cdot}5 & 0 \\ 0 & 0 & 0{\cdot}1 \end{bmatrix} \quad H = \begin{bmatrix} 1 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} \quad y = \begin{bmatrix} 0{\cdot}5 \\ 0{\cdot}45 \\ 0{\cdot}51 \end{bmatrix}$$

   7 + 8

8. a) Write a short note on 'ABT'.

   b) A factory to be set up is to have a fixed load of 760 kW at 0·8 pf. The electricity board offers to supply energy at the following alternate rates :

      i) LV supply at Rs 32/kVA max demand/annum + 10 paise/kWh

      ii) HV supply at Rs 30/kVA max demand/annum + 10 paise/kWh

   The HV switchgear costs Rs 60/kVA and switchgear losses at full load amount to 5%. Interest, depreciation charges for the switchgear are 12% of the capital cost. If the factory is to work for 48 hours/week, determine the more economical tariff. 7 + 8

9. a) How can high diversity be achieved ? Explain whether it is desirable or not.

   b) There are three consumers of electricity having different load requirements at different times. Consumer *A* has a maximum demand of 5 kW at 6 p.m. and a demand of

3 kW at 7 p.m. and daily load factor of 20%. Consumer *B* has a maximum demand of 5 kW at 11 a.m., a load of 2 kW at 7 p.m. and an average load of 1·20 kW. Consumer *C* has an average load of 1 kW and his maximum demand is 3 kW at 7 p.m. Determine

i) the diversity factor

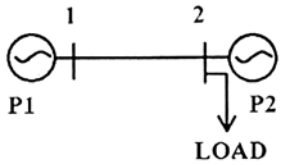
ii) the load factor and average load of each consumer

iii) the average load and load factor of the combined load.

(4 + 2) + 9

10. a) How the transmission loss formula is expressed ? Draw the flow chart for the solution of coordination equation considering transmission loss.

b) A two-bus system is shown in given figure. If a load of 125 MW is transmitted from plant 1 to the load, a loss of 15·625 MW is incurred. Determine the generation schedule and load demand if the cost of received power is Rs 24/MWhr.



The incremental production cost of the plants are

$\frac{dF_1}{dP_1} = 0 \cdot 025P_1 + 15$, $\frac{dF_2}{dP_2} = 0 \cdot 05P_2 + 20$. (1 + 7) + 7

11. Write short notes on any *two* of the following : 2 × 7½

a) Unit commitment

b) Cost of power generation for thermal, hydro, nuclear power plants

c) Spinning reserve.

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