



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PE-EE 701 C Power Generation Economics

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[ 1 x 10 = 10 ]

- (i) The other name of two-part tariff is \_\_\_\_\_
- (ii) The shutdown cost of a system is usually considered as \_\_\_\_\_
- (iii) The Lagrangian multiplier for load scheduling is denoted by \_\_\_\_\_
- (iv) Least square estimation is one of the techniques of power system for \_\_\_\_\_
- (v) The decrease in the cost of power plant due to its use is called \_\_\_\_\_
- (vi) The other name of three-part tariff is \_\_\_\_\_
- (vii) The constraints which are due to the balancing of load demand and generation output are called \_\_\_\_\_
- (viii) For determining the solution for optimal generation initially \_\_\_\_\_ is assumed.
- (ix) Weighted Least square estimation is one of the techniques of power system for \_\_\_\_\_
- (x) Hydel power plant can be used as \_\_\_\_\_ load plant.
- (xi) For a generating plant Utilization factor is always less than 1. True or False.
- (xii) The variable charge of availability based tariff is:

## Group-B (Short Answer Type Question)

Answer any three of the following

[ 5 x 3 = 15 ]

2. What is block rate tariff? Explain by a diagram/graph. Which type of consumers are mainly subjected to this tariff? [ 5 ]
3. What is incremental fuel cost with reference to hydro generating units? [ 5 ]
4. A consumer has a maximum demand of 500 kW at 30% yearly load factor. If the tariff is Rs 100 per kW of maximum demand plus 20 paise per kWh, find the overall cost per kWh. [ 5 ]
5. Two units of a plant have fuel costs of [ 5 ]  
 $F_a = 0.4 P_1^2 + 10 P_1 + 25$  Rs/hr  
 $F_b = 0.35 P_2^2 + 6 P_2 + 20$  Rs/hr  
 If the load supplied is 220 MW, find the optimal division of load between two generators neglecting transmission losses.
6. The fuel cost of generators G1 and G2 are  $C_1(P_{G1}) = 10,000$  Rs/MWhr and  $C_2(P_{G2}) = 12,500$  Rs/MWhr and the loss in the line is  $P_{l.p.u.} = 0.5 \times P_{G1(p.u.)}^2$  where the loss coefficient is specified in p.u. on a MVA base. Find the most economic power generation schedule for load of 40 MW. [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following

[ 15 x 3 = 45 ]

7. (a) What are the benefits and drawbacks of tariff system? [ 5 ]  
 (b) Compare three-part, two-part and block rate tariff systems. Give a graphical/diagrammatic representation of the given tariff systems. [ 10 ]
8. Write notes on the following: [ 15 ]  
 (i) Spinning reserve  
 (ii) Penalty factor of a unit  
 (iii) Constraints in unit commitment.
9. (a) What are the important criteria for selection of number and size of generating units. [ 5 ]

✓ (b) A proposed station has the following daily load cycle:

Time in hours	6-8	8-11	11-16	16-19	19-22	22-24	24-6
Load in MW	20	40	50	35	70	40	20

Draw the load curve and select suitable generator units from the 10, 20, 25 and 30 MVA. Prepare the operation schedule for the machines selected and determine the load factor from the curve.

10. (a) What is meant by availability base tariff? What is the motive of applying such tariff? [ 7 ]
- (b) Determine the load factor at which the cost of supplying a unit of electricity from a hydel and steam station is same if the annual fixed charge for hydel station is Rs 300 per kW and for steam station is Rs 1200 per kW as well as running charges for hydel station is 25 paise per kWh and for steam station is 6.25 paise per kWh. [ 8 ]
11. (a) What is sinking fund method of finding depreciation of a power plant? [ 8 ]
- (b) The equipment in a power station costs Rs 15,60,000 and has a salvage value of Rs. 60,000 at the end of 25 years. Determine the value of the equipment at the end of 20 years by sinking fund method at 5% compound interest annually. [ 7 ]

\*\*\* END OF PAPER \*\*\*

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