

Roll No.

Total No. of Pages : 03

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M.Tech.(EE) (2013 Batch) (Sem.-2)
POWER SYSTEM OPERATION AND CONTROL

Subject Code : MTEE-201

M.Code : 71356

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT questions.
2. Each question carries TWENTY marks.
3. Assume any missing data appropriately.

Q1. (a) Explain input-Output Characteristic of a steam turbine. State the difference between fuels of Higher Heating Value and Lower Heating Value. (10)

(b) Explain how tie-line power flow between interconnected areas can be controlled? (10)

Q2. (a) Derive an expression for penalty factor considering transmission losses in the economic dispatch problems. (10)

(b) A system consisting of two units to meet the daily load curve as shown in Fig. The cost characteristics of the units are : (10)

$$C_1 = 0.30P_{G1}^2 + 85P_{G1} + 130 \text{ Rs./hr}; C_2 = 0.20P_{G2}^2 + 65P_{G2} + 150 \text{ Rs./hr}$$

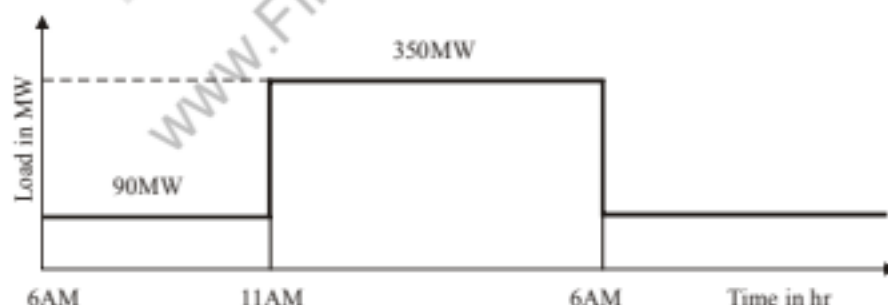


Fig.1

Determine, the economical distribution of a loads during the light-load period of 5hr and during the heavy-load periods of 19hr. Also, find the operation cost for this 24hr period operation of two units. The maximum and minimum loads on units are to be 220 and 30 MW, respectively.

Q3. (a) Discuss and explain lambda search technique. Explain any method of optimization where lambda search technique is not suitable. (10)

(b) Explain dynamic programming method used for unit commitment problem. (10)

Q4. (a) Explain Pumped Storage hydro plant operation. Also explain its scheduling with λ - γ Iteration. (8)

(b) A pumped storage plant is to operate so as to minimize the operating cost of the steam units to which it is connected. The pumped storage plant has the following characteristics :

Generating : q positive when generating, P_H is positive and $0 \leq P_H \leq + 350\text{MW}$

$q(P_H) = 350 + 3.5 P_H \text{ acre-ft } (P_H \text{ in MW}) [1 \text{ acre-ft} = 660 \times 60 \times 1 \text{ ft}^3]$

Generating : q negative when generating, P_H is negative and $-300 \leq P_p \leq 0$

$q(P_p) = -850 \text{ acre-ft/h } P_p = -300\text{MW}$.

Operating Restriction : the pumped hydro plant will be allowed to operate only at -300 MW when pumping. Cycle efficiency $\eta = 0.60$ [the efficiency has already been built into $q(P_H)$ equations].

The equivalent steam system has the cost curve

$F(P_s) = 3877.5 + 3.98 P_s + 0.002 P_s^2 \text{ Rs./hr } (200\text{MW} \leq P_s \leq 2500\text{MW})$

Find the optimum pump-generate schedule using the gradient method for the load of 1600, 1800, 1600, 500, 500, 500 MW each for a period of 4 hr. The reservoir starts at 8000 acre-ft and must be at 8000 acre-ft at the end of sixth period. (12)

Q5. (a) Explain Block diagram of governor with droop also draw the speed droop characteristics. (8)

(b) Derive an expression for swing equation of a synchronous generator, and explain with the help of block diagram the relationship between electrical power and speed change. (12)

Q6. (a) Derive an expression for area control error for multi-area system. (05)

(b) For a given single area with three generators connected to a common bus feeding a load. The following table contains the rating and speed droop, and initial loading of each generator. Assume $D = 0$; what is the new generation on unit for a 50-MW load increase? Repeat with $D = 1.0 \text{ p.u.}$

Unit	Rating (MVA)	Speed Droop (R) p.u. on unit base	Initial Loading (MW)
1	100	0.01	85
2	500	0.015	300
3	500	0.015	450

Load base=1000MVA. (15)

Q7. Explain the following :

- (a) Linear programming methods for optimal power flow evaluation. (10)
- (b) Explain the base point and participation factors involved in economic dispatch. (10)

Q8. Write short notes on the following :

- (a) Co-generation plants (5)
- (b) Operation and Maintenance Cost (5)
- (c) Penalty factor (5)
- (d) Compare economic dispatch and unit commitment. (5)

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.