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Question Paper Code : 80508

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh Semester

Electrical and Electronics Engineering

EE 2401/EE 71/10133 EE 701 - POWER SYSTEM OPERATION AND CONTROL

(Regulations 2008/2010)
(Common to PTEE 2401— Power System Operation and Control for B.E. (part-Time) Fifth Semester—Electrical and Electronics Engineering — Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define plant capacity factor.

2. List out the various needs for frequency regulation in power system.

3. What is the function of load frequency control on a power system.

4. Define speed droop.

5. What are the different types of reactive power compensation?

6. Define “Booster transformer”.

7. Draw incremental fuel cost curve.

8. Define crew constraints.

9. What role SCADA plays in electrical power systems?

10. What are responsibilities of regional load dispatch centres?

PART B — ($5 \times 16 = 80$ marks)

11. (a) (i) A generating station has a maximum demand of 50,000 kW. Calculate the cost per unit generated from the following data. (12)

Capital cost = Rs.95×10^6

Annual load factor = 40%

Annual cost of fuel and oil Rs.9×10^6

Taxes, wages and salaries, etc. = Rs.7.5×10^6

Interest and depreciation = 12%

(ii) (1) Define 'Diversity factor'. (4)

(2) Define 'Plant use factor'.

Or

(b) (i) Define the following:

(1) Hot reserve

(2) Cold reserve

(3) Spinning reserve. (6)

(ii) A generating station has the following daily load cycle:

Time (Hours)	0-6	6-10	10-12	12-16	16-20	20-24
Load (MW)	20	25	30	25	35	20

Draw the load curve and calculate

(1) Maximum demand

(2) Units generated per day

(3) Average load

(4) Load factor. (10)

12. (a) (i) Develop a schematic of speed governing system and explain its operation. (8)

(ii) Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. Assume that the generators are operating at 50 Hz no load, how would a load of 600 MW be shared between them? What will be the system frequency at this load? Assume free governor operation. (8)

Or

(b) Draw the block diagram of uncontrolled two area frequency control system and explain the salient features under static conditions. (16)

13. (a) Draw the, circuit diagram for a typical excitation system and derive the transfer function model and draw the block diagram. (16)

Or

(b) Explain different types of static VAR compensators with a phasor diagram. (16)

14. (a) (i) Explain the λ-iteration method for finding the solution of economic dispatch including transmission losses with a neat flowchart. (10)

(ii) A generating unit has two 200 MW units whose input cost data is as follows:

$F_1 = 0.004P_1^2 + 80RS/hr$

$F_2 = 0.006P_2^2 + 1.5P_2 + 100Rs/hr$

For a total load of 250 MW, find the load dispatch between the two units for economic operation. (6)

Or

(b) (i) Explain the priority list method for unit commitment problem. (10)

(ii) Define

(1) Minimum up time,

(2) Minimum down time

(3) Spinning reserve. (6)

15. (a) What is state estimation with respect to power system? Explain briefly the method of maximum likelihood weighted least squares estimation. (16)

Or

(b) What is normal operating state of a power system? Describe in detail the various states that a power system takes, with their operating conditions. (16)

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