Exam.Code:1017
Sub. Code: 7472

2023

M.E. Electrical Engineering (Power System)

First Semester

EE-8102: Power System Operation and Control

Time allowed: 3 Hours | Max. Marks: 50

***NOTE:** Attempt any five questions. All questions carry equal marks.*

x-x-x

Que 1. (a). Explain the significance of load factor and diversity factor. Also discuss why maximum demand of a group of consumers is always less than the sum of their individual demands. Even if the maximum demand and load factors of two systems are equal, their load duration curves may not be similar, discuss why?

(b) A generating station has the following daily loads:

0-6 hrs	4500kW;	6-8 hrs	3500kW;	8-12 hrs	7500kW;
12-14 hrs	2000kW;	14-18 hrs	8000kW;	18-20 hrs	2500kW;
20-24 hrs	6000kW				

Sketch the load duration curve and determine the load factor and plant capacity factor, if the capacity of the plant is 12 MW.

Que 2. (a) What do you mean by spinning reserve and does this reserve helpful in operating a power system efficiently. How is it different from the operating reserve?

(b) Discuss the importance of load forecasting with suitable examples. What is the necessity of long term load forecasting? Explain different techniques of load forecasting in a power system operation.

Que 3. (a). What is the need of a governing mechanism? Illustrate with neat diagram the operation of a speed governing mechanism.

(b) With a neat diagram, explain the single area load frequency control system.

Que 4. A power system has a total load of 1250 MW at 50 Hz. The load varies 1.5% for every 1% change in frequency. Find the steady state frequency deviation when a 50 MW load is suddenly tripped if (i) there is no speed control, (ii) the system has 250 MW of spinning reserve evenly spread among 500 MW of generating capacity. Assume that the effect of governor dead bands is such that only 80% of the governor respond to the reduction in system load.

Que 5. The incremental cost of three units in a plant are:

$IC_1 = 0.8P_1 + 160$ Rs/MWh;

$IC_2 = 0.9P_2 + 120$ Rs/MWh; and

$IC_3 = 1.25P_3 + 110$ Rs/MWh

Where P1, P2, P3 are power output in MW. Determine the optimum load allocation when the total load is 242.5 MW. Using participating factors determine the optimum scheduling when the load increased to 250 MW.

Que 6. (a) Explain with neat diagram the excitation system and its modelling with relevant transfer functions.

(b) Derive the complete block diagram of AVR. Perform the static and dynamic analysis of AVR.

Que 7. What are the constraints in solving unit commitment problems? Explain with a neat flow chart the lambda iteration method for solving the economic dispatch problem without loss.

Que 8. There are three thermal generating units which can be committed to take the system load. The fuel cost data and generation operating unit data are given below:

$F_1 = 392.7 + 5.544P_1 + 0.001093\,P_1^2$

$F_2 = 217 + 5.495P_2 + 0.001358\,P_2^2$

$F_3 = 65.5 + 6.695P_3 + 0.004049\,P_3^2$

P_1, P_2, P_3 in MW generation with maximum limits of 600MW, 400MW and 200MW respectively. There are no other constraints on system operation. Obtain an optimum unit commitment table using suitable technique.

x-x-x