

**INSTITUTE OF AERONAUTICAL ENGINEERING**

(Autonomous)

Dundigal-500043, Hyderabad

**B.Tech VII SEMESTER END EXAMINATIONS (REGULAR) - FEBRUARY 2022**

Regulation: R18

**POWER SYSTEM OPERATION AND CONTROL**

Time: 3 Hours

(EEE)

Max Marks: 70

Answer FIVE Questions choosing ONE question from each module  
(NOTE: Provision is given to answer TWO questions from any ONE module)

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

**MODULE – I**

1. (a) Explain the objective of economic dispatch and the difficulties in execution. [7M]  
(b) Derive the evaluation of penalty factor for economic distribution of loads between the units of a plant. [7M]
2. (a) Explain the methods of scheduling power generation of steam plants and their merits and demerits. [7M]  
(b) The fuel cost of plants I and II are given as  
 $F_1 = 0.2P_1^2 + 40 P_1 + 120\text{Rs/hr}$   
 $F_2 = 0.25P_2^2 + 30P_2 + 150\text{Rs/hr}$   
Determine the economic operating schedule and corresponding cost of generation if the max and min loading on each unit is 100 MW and 25 MW and the demand is 180 MW and transmission losses are neglected. If the load is equally shared by both the units, determine the saving obtained by loading the units as per equal incremental production cost. [7M]

**MODULE – II**

3. (a) Explain the working and modeling of turbine speed governing system. [7M]  
(b) With neat diagram demonstrate the working of AC excitation system. [7M]
4. (a) Draw the block diagram of an isolated power system and explain the modeling of each block. [7M]  
(b) Describe the types of excitation systems and explain the working of static excitation system with block diagram. [7M]

**MODULE – III**

5. (a) Explain the coordination between load frequency control(LFC) and economic dispatch. [7M]  
(b) Describe LFC control of single area and derive the steady state frequency error. [7M]
6. (a) Explain the automatic load frequency control system with complete block diagram and modeling of sub blocks. [7M]  
(b) Two generators rated 250 MW and 500 MW are operating in parallel. The droop characteristics are 4% and 6% respectively. Assuming that the generators are operating at 50 HZ at no load, how a load of 750 MW would be shared. What is the system frequency? Assume free governor action. [7M]

## MODULE – IV

7. (a) Explain the design and working of static VAR compensators. Discuss about the losses occurred due to VAR flow in power system. [7M]
- (b) A 3phase transformer rated 7000kVA has a over load capability of 125% of the rating. If the connected load is 1150 kVA with a 0.8 p.f(lag), determine the following:
- i) The kVAR rating of shunt capacitor bank required to decrease the kVA load of the transformer to its capability level
  - ii) The p.f. of the corrected level
  - iii) The kVAR rating of the shunt capacitor bank required to correct the load p.f. to unity. [7M]
8. (a) List the methods of voltage control and explain any two methods in detail. [7M]
- (b) Illustrate the role of capacitive and inductive compensators generation control. [7M]

## MODULE – V

9. (a) List the characteristics of ideal load compensation and list the typical loads which require compensation. [7M]
- (b) What are the specifications of load compensation? Derive the relation between voltage and reactive power. [7M]
10. (a) Explain how reactive power management can be achieved through load compensation. [7M]
- (b) A load of 30 MW, 45 MVAR is connected to a line where X to R ratio is 5 and the short circuit capacity of the load bus is 250 MVA. The supply voltage is 11 kV and the load is star connected. Determine the load bus voltage. [7M]

