**20EE701**

**Hall Ticket Number:**

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| **IV/IV B.Tech (Regular) DEGREE EXAMINATION** | | | | |
| **December, 2023** | | **Electrical & Electronics Engineering** | | |
| **Seventh Semester** | **Power System Operation Control and Stability** | | | |
| **Time:** Three Hours | | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | What is the purpose of an economic distribution of load between units in a power system? | CO1 | L4 | 1M |
|  | b) | What does a capability diagram of a synchronous generator represent? | CO1 | L4 | 1M |
|  | c) | What is the unit of B-coefficient? | CO1 | L4 | 1M |
|  | d) | What are the components of the load frequency control (LFC) loop in a power system? | CO2 | L4 | 1M |
|  | e) | What is the main objective of load frequency control (LFC) in a power system? | CO2 | L4 | 1M |
|  | f) | In a power system, what is the role of the load frequency control (LFC) in maintaining the stability of the system? | CO2 | L4 | 1M |
|  | g) | What is the load flow solution technique? | CO3 | L4 | 1M |
|  | h) | What is the primary function of the excitation system (exciter) in a synchronous generator? | CO3 | L4 | 1M |
|  | i) | What is the need for load flow study? | CO3 | L4 | 1M |
|  | j) | What is the main difference between static capacitors and static VAR compensators (SVCs) in reactive power compensation? | CO3 | L4 | 1M |
|  | k) | Define steady state stability. | CO4 | L4 | 1M |
|  | l) | Define the inertia constants M and H. What is their relation? | CO4 | L4 | 1M |
|  | m) | What is meant by voltage stability? | CO4 | L4 | 1M |
|  | n) | What is the main difference between angle and voltage stability? | CO4 | L4 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Explain the concept of economic dispatch in a thermal power station. | CO1 | L3 | 7M |
|  | b) | Derive transmission line loss formula using B-coefficients | CO1 | L3 | 7M |
| **(OR)** | | | | | |
| 3 | a) | Describe the capability diagram of a synchronous generator. | CO1 | L2 | 7M |
|  | b) | The fuel cost function for three thermal plants in Rs/hr are given by C1=450+5.13P1+0.003P12 ,C2=350+5.3P2+0.005P22, C3=250+5.6P3+0.008P32 Where P1, P2 and P3 are in MW, the total load PD=850 MW, neglecting line losses and generator limits find the optimal dispatch and the total cost in Rs/hr. | CO1 | L2 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Explain the importance of keeping voltage and frequency constant in a power system. | CO2 | L3 | 7M |
|  | b) | Explain the block diagram representation of Automatic Generation Control (AGC) for an isolated power system. | CO2 | L3 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Discuss the importance of steady state analysis in Load Frequency Control (LFC) of a power system. | CO2 | L3 | 7M |
|  | b) | A 100 MVA synchronous generator operates on full load at a frequency of 50 Hz. The load is suddenly reduced to 50 MW. Due to time lag in governor system, the steam valve begins to close after 0.4 s. Determine the change in frequency that occurs in this time. Given: H = 5 kWs/kVA of generator capacity. | CO2 | L2 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Define the Load Flow Problem and explain its importance in Power Systems. | CO3 | L4 | 7M |
|  | b) | Discuss the Gauss-Seidel method for solving the Load Flow equations. | CO3 | L3 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Discuss the role of excitation systems in Power Systems and explain the simplified AVR block diagram. | CO3 | L3 | 7M |
|  | b) | Discuss the different methods of transmission line compensation and their uses in power systems. | CO3 | L3 | 7M |
| **Unit-IV** | | | | | |
| 8 | a) | Explain the equal area criterion of stability and its applications in power system stability analysis. | CO5 | L3 | 7M |
|  | b) | Compare and contrast the concepts of angle voltage stability, reactive power flow, and voltage collapse in power systems. | CO5 | L3 | 7M |
| **(OR)** | | | | | |
| 9 | a) | Develop the swing equation of a synchronous machine connected to an infinite bus. | CO5 | L2 | 7M |
|  | b) | A 50Hz, 4 pole turbo generator rated at 20 MVA, 13.2kV has inertia constant H=9kW-sec/kVA. Determine the kinetic energy stored in the rotor at synchronous speed. | CO5 | L2 | 7M |

