Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2024

Course: Power system II **Semester: VI**

Program: B.Tech. Electrical Engg. **Time : 03 hrs.**

Course Code: EPEG 3011 **Max. Marks: 100**

No. of pages (2)

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Differentiate between rotor angle stability and voltage stability of power system	**4**	**CO1**
Q 2	Elucidate the significance of critical clearing angle in terms of stability.	**4**	**CO1**
Q 3	A four-pole, 60-Hz synchronous generator has a rating of 200 MVA, 0.8 power factor lagging. The moment of inertia of the rotor is 45,100 kg.m^2. Determine M and H.	**4**	**CO2**
Q 4	Two turbo alternators rated for 110 MW and 210 MW have governor drop characteristics of 5 percent from no load to full load. They are connected in parallel to share a load of 250 MW. Determine the load shared by each machine assuming free governor action.	**4**	**CO2**
Q 5	Classify various types of buses in a power system for load flow studies. Justify the classification.	**4**	**CO1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Develop load flow equations suitable for solution by Gauss-Seidel method using nodal admittance approach.	**10**	**CO2**
Q 7	Discuss the application of equal area criterion for the system stability study when a sudden fault takes place in the system and gets cleared after some time.	**10**	**CO3**
Q 8	Elaborate an expression for reactive power flow when a generator is connected to an infinite bus through a tie-line of reactance X. Show that the active power flow depends upon the load angle δ whereas the reactive power upon the voltage gradient. **OR** Describe the short circuit capacity of a bus or fault level of a bus. Explain how the short circuit capacity and voltage regulation of a bus are related.	**10**	**CO3**
Q 9	A system consists of two plants connected by a tie line and a load is located at plant 2. When 100 MW are transmitted from plant 1, a loss of 10 MW takes place on the tie-line. Determine the generation schedule at both the plants and the power received by the load when λ for the system	**10**	**CO2**

	is Rs. 25 per megawatt hour and the incremental fuel costs are given by the equation: $\frac{dF_1}{dP_1} = 0.03\,P_1 + 17$ Rs./MWhr $\frac{dF_2}{dP_2} = 0.06\,P_2 + 19$ Rs./MWhr		
SECTION-C (2Qx20M=40 Marks)			
Q 10	The load flow data of a four-bus system is given in Tables I and II. Taking bus 1 as slack bus determine the voltages of all buses at the end of first iteration starting with a flat voltage profile using Newton-Raphson method. Table-I Bus code | Impedance Bus code | Line changing Admittance y/2 1-2 | 0.02+j0.08 | j0.05 1-3 | 0.06+j0.24 | j0.06 2-3 | 0.04+j0.16 | j0.05 2-4 | 0.04+j0.16 | j0.025 3-4 | 0.01+j0.04 | j0.015 Table-II Bus code | Assume voltages | Generation | | load | | | | | M.W. (pu) | MVAr (pu) | M.W. (pu) | MVAr (pu) 1 | 1.06+j0.0 | 0.0 | 0.0 | 0.0 | 0.0 2 | 1.0+j0.0 | 0.0 | 0.0 | 0.2 | 0.1 3 | 1.0+j0.0 | 0.0 | 0.0 | 0.5 | 0.2 4 | 1.0+j0.0 | 0.0 | 0.0 | 0.4 | 0.05	**20**	**CO3**
Q 11	a. Appraise the role of AVR in improving synchronous stability. b. A motor is receiving 25% of the power that it is capable of receiving from an infinite bus. If the load on the motor is doubled, calculate the maximum value of δ during the swinging of the rotor around its new equilibrium position. **OR** A 50 Hz generator is delivering 50% of the power that it is capable of delivering through a transmission line to an infinite bus. A fault occurs that increases the reactance between the generator and the infinite bus to 500% of the value before the fault. When the fault is isolated, the maximum power that can be delivered is 75% of the original maximum value. Determine the critical clearing angle for the condition described.	**20**	**CO4**