Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2019

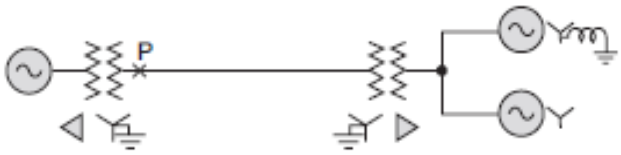
Programme Name: B. Tech PSE **Semester : VII**
Course Name : Power System Analysis and Stability **Time : 03 hrs**
Course Code : PSEG 317 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: All questions are mandatory. Assume parameters wherever required and mention the same.

SECTION A

S. No.		Marks	CO
Q 1	In a 57-bus power system, there are 10 generators. In a particular iteration of Newton Raphson load flow technique (in polar coordinates), two of the PV buses are converted to PQ type. Determine the order of Jacobian matrices.	**4**	**CO1,CO4**
Q 2	Explain the need of slack bus in a power system.	**4**	**CO2**
Q 3	Derive the relationship of active power in terms of symmetrical components.	**4**	**CO3**
Q 4	Discuss the importance of swing equation in case of steady state stability of the power system.	**4**	**CO4**
Q 5	A system has 100 buses of which 20 buses are generator bus. Determine the number of load buses.	**4**	**CO1,CO4**

SECTION B

Q 6	Compare the performance of Gauss and Gauss-Seidel method applied for load flow analysis.	**10**	**CO1**
Q 7	A 40 MVA, 13.5 kV alternator with solidly grounded neutral has a sub-transient reactance of 0.20 p.u. The negative and zero sequence reactance are 0.15 and 0.1 p.u. respectively. A single line to ground fault occurs at the terminals of an unloaded alternator. Determine the fault current and the line-to-line voltages. Neglect resistance.	**10**	**CO3**
Q 8	The fuel inputs per hour of plants 1 and 2 are given as $F1 = 0.8\ P_1^2 + 60\ P1 + 160$ Rs. per hr $F2 = 0.6\ P_2^2 + 90\ P2 + 150$ Rs. per hr Determine the economic operating schedule and the corresponding cost of generation if the maximum and minimum loading on each unit is 250 MW and 100 MW, the demand is 360 MW, and transmission losses are neglected. If both the units equally share the load, determine the saving obtained by loading the units as per equal incremental production cost. **(OR)** A two-bus system is shown in Figure A. If a load of 125 MW is transmitted from plant 1 to the load, a loss of 15.625 MW is incurred. Determine the generation schedule and the	**10**	**CO2**

	load demand if the cost of received power is Rs. 24/MWhr. Solve the problem using the penalty factor method approach. The incremental production costs of the plants are $dF_1/dP_1 = 0.025P_1 + 15$ $dF_2/dP_2 = 0.025P_2 + 20.$  Figure A		
Q 9	Derive the swing equation in power system dynamics. Also, analyze steady state stability of the power system by the linearization of swing equation.	**10**	**CO4**
	SECTION-C		
Q 10	A 30 MVA, 13.8 kV, 3-phase alternator has a sub transient reactance of 15% and negative and zero sequence reactance of 15% and 5% respectively. The alternator supplies two motors over a transmission line having transformers at both ends as shown in figure B. The motors have rated inputs of 20 MVA and 10 MVA both 12.5 kV with 20% sub transient reactance and negative and zero sequence reactance are 20% and 5% respectively. Current limiting reactors of 2.0 ohms each are in the neutral of the alternator and the larger motor. The 3-phase transformers are both rated 35 MVA, 13.2 Δ / 115Y kV with leakage reactance of 10%. Series reactance of the line is 80 ohms. The zero sequence reactance of the line is 200 ohms. Determine the fault current when a line-to-line fault takes place at point *P*.  Figure B	**20**	**CO3**
Q 11	a. A 3-bus power system network consists of 3 transmission lines. The bus admittance matrix of the uncompensated system is $\begin{bmatrix} -j6 & j3 & j4 \\ j3 & -j7 & j5 \\ j4 & j5 & -j8 \end{bmatrix}$ pu. If the shunt capacitance of all transmission line is 75% compensated then determine the new bus admittance matrix. b. Derive the expressions for per unit values of Impedance, Power and Current in terms of its base value and actual values. c. Explain why first row and column of Y bus matrix is neglected while performing computer aided load flow analysis. **(OR)** Derive the set equations of Jacobian matrix used in Newton Raphson method in polar form.	**10+5+5** **20**	**CO1,CO4**