Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, December 2020

Course: Power System Analysis & Stability — **Semester: VII**
Program: B. Tech PSE — **Time: 03 hrs.**
Course Code: EPEG 3005 — **Max. Marks: 100**

SECTION A

1. Each Question will carry 5 Marks
2. Instruction: Write short / brief notes

S. No.		CO
Q 1	A system has 100 buses of which 20 buses are generator bus. The number of load buses is _____	**CO 1**
Q 2	i. The p.u. impedance value of an alternator corresponding to base values 13.5 kV and 60 MVA is 0.2 p.u. The p.u. value for the base values 13.8 kV and 50 MVA will be _____ [2.5 Marks] ii. The per unit impedance of a circuit element is 0.15. If the base kV and base MVA are halved, then the new value of the per unit impedance of the circuit element will be _____ [2.5 Marks]	**CO 1**
Q 3	i. If the reactive power limits are violated in a _____bus than that bus is treated as a _____bus ii. In Gauss-Seidel method of power flow problem, the number of iterations may be reduced if the correction in voltage at each bus is multiplied by (*a*) Gauss constant (*b*) Acceleration factor (*c*) Deceleration constant (*d*) Blocking factor iii. Active and reactive power are defined in _____bus. iv. The per-unit impedance of transformer is same irrespective of primary and secondary side. True / False?	**CO 2**
Q 4	The generated power by two plants are P_1 = 50 MW, P_2 = 70 MW. The loss coefficients are given by B_{11} = 0.001, B_{22} = 0.0025 and B_{12} = -0.0004. The power loss in the system will be _____	**CO 2**
Q 5	An alternator with transient reactance equal to 0.1 p.u. on a 100 MVA base is connected to the high voltage bus through a step-up transformer of reactance 0.1 p.u. on a 100 MVA base. The fault level at the bus is _____ MVA.	**CO 3**
Q 6	i. The kinetic energy stored, by a 50 MVA, 50 Hz two pole alternator with an inertia constant (*H*) of 5 kW sec. per KVA, is _____ [4 Marks] ii. According to equal area criterion the system will be stable if _____ [1 Mark]	**CO 4**

SECTION B

1. Each question will carry 10 marks
2. Instruction: Write short / brief notes

Q 7	Explain clearly with a flow chart the computational procedure for load flow solution using Newton-Raphson method when the system contains all types of buses.	**CO 1**
Q 8	Incremental fuel costs in Rs. per megawatt hour for two units in a plant are given by $dF/dP_1 = 0.1\ P1 + 20$ $dF/dP_2 = 0.12\ P2 + 16$ The minimum and maximum loads on each unit are to be 20 MW and 125 MW respectively. Determine the incremental fuel cost and the allocation of load between units for the minimum cost when loads are (i) 100 MW, (ii) 150 MW. Assume both the units are operating.	**CO 2**
Q 9	The fuel inputs per hour of plants 1 and 2 are given as $F1 = 0.7\ P_1^2 + 55\ P_1 + 140$ Rs. per hr $F2 = 0.5\ P_2^2 + 80\ P_2 + 120$ 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.	**CO 2**
Q 10	A 50 MVA, 11 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactances are 0.25 and 0.05 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.	**CO 3**
Q 11	A 50 Hz four-pole turbogenerator rated 20 MVA, 13.2 kV has an inertia constant of H = 9.0 kW-sec/kVA. Determine the K.E. stored in the rotor at synchronous speed. Determine the acceleration if the input less the rotational losses is 25000 HP and the electric power developed is 15000 kW. If the acceleration computed for the generator is constant for a period of 15 cycles, determine the change in torque angle in that period and the r.p.m. at the end of 15 cycles. Assume that the generator is synchronized with a large system and has no accelerating torque before the 15 cycle period begins.	**CO 4**

Section C

1. Each Question carries 20 Marks.

2. Instruction: Write long answer.

Q 12	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.	**CO 1**