M. E. ELECTRICAL ENGG. 1ˢᵗ YEAR 2ⁿᵈ SEMESTER EXAMINATION 2019

POWER SYSTEM ANALYSIS (PS)

Time: Three hours   Full Marks: 100

Figures in the margin indicate full marks
(Answer any five Question)

1.(a)	Formulate the Newton-Raphson Load flow in rectangular coordinate system. Which applications of load flow require rectangular coordinate formulation?	(5 + 3)
(b)	Explain the solution algorithm of the Newton-Raphson load flow.	(12)
2.(a)	How shunt capacitors, tap changing transformers and phase shifters are represented in Fast decoupled load flow?	(6)
(b)	Why the Generator buses are considered to have known voltage magnitudes?	(4)
(c)	How optimum multipliers are used to improve the convergence of Newton-Raphson Load flow?	(10)
3.(a)	How ranking of contingencies helps in monitoring the security of power system?	(6)
(b)	How linear sensitivity factors are used for contingency analysis of Power Systems?	(14)
4.(a)	Define Optimum Power flow problem. Mention various applications of the Optimum Power flow problem.	(4 + 6)
(b)	Discuss the solution of the OPF problem using gradient technique.	(10)
5. (a)	Derive the expression for the fault current in Symmetrical component system in terms of the Bus impedance matrix and fault admittance matrix.	(10)
(b)	Hence derive expression for the fault current for a line to ground fault at kth bus of the system.	(10)
6.(a)	How the load and Generators are represented in load flow solution while performing transient stability analysis?	(10)
(b)	Differentiate between Steady state, Dynamic and transient stability problems in power system.	(5)

(c)   How the solution of the swing equations are interpreted to assess the stability of the   (5)
        system?

7.(a)   A 11 kV feeder consists of an overhead line of 4 km long followed by an underground   (12)
        cable of 1 km long and terminates in a 11 kV/415 V distribution transformer.
        3 faults per circuit km for the overhead line and 1 fault per circuit km of the
        underground cable have been reported during the last 10 years. Annual cable
        termination fault rate is 0.03. Repair times are: 3 hours for overhead line, 25 hours for
        underground cable and 4 hours per cable termination. Determine annual fault rate,
        average repair time and availability of the feeder.

(b)   A generating station is having 3 generators each of 200 MW capacity, with a   (8)
        forced outage rate 0f 0.02. Prepare the capacity outage probability table for the
        generating station.

8.(a)   Explain the procedure of modifying the bus impedance matrix of a power system when   (10)
        a new line is erected between two existing buses of the system.

(b)   Discuss the method of load modeling for reliability analysis in frequency and duration   (10)
        approach.