Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PEL6I102

6th Semester Regular / Back Examination 2018-19
POWER SYSTEM OPERATION & CONTROL
BRANCH : EEE
Max Marks : 100
Time : 3 Hours
Q.CODE : F218

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) State the advantages of per unit system in power system analysis.
b) Find the complex power, when the voltageand currents are 100+30j Volt and25+12j Amp respectively.
c) State atleast two differences between Newton Raphson and Fast Decoupled load flow methods.
d) Briefly differentiate between Economic Load Dispatch and Unit Commitment.
e) What is Penalty factor?
f) What is spinning reserve?
g) Briefly explain the significance of ACE in multi-area AGC.
h) What is the purpose of adding a secondary integral loop of control in load frequency control loop?
i) Write the swing equation. Define the various terms involved.
j) An alternator supplies 50 MW to an infinite bus, the steady state power limit is 75MW. Determine whether system will remain stable if prime mover input is suddenly increased by 25 MW. Neglect losses.

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) A single phase 1000V source is connected across three loads Z_1=60 Ω, Z_2= 6+12j and Z_3=30-30j. Find the power absorbed by each load and the total complex power.
b) Derive the power flow equation for a system containing n-buses and making suitable assumptions. State the various types buses in the system.
c) A power system has the impedances between various buses: bus-1 to reference 2j Ω, bus-2 to reference 2j Ω, bus-3 to reference 2j Ω, bus-1 to bus-3 0.2j Ω, bus-2 to bus-3 0.4j Ω, bus-1 to bus-4 0.2j Ω, bus-2 to bus-4 0.4j Ω, bus-3 to bus-4 0.1j Ω. Draw a configuration of the system and find the bus admittance matrix.
d) Explain how a bus admittance matrix is modified when a voltage regulator is connected to a particular bus in a power system.
e) Derive the transmission loss equation in terms of power output of the plants considering a simple system. The power generated by two plants are P_1=40MW and P_2=50MW. If loss coefficients are B_{11}=0.001, B_{22}=0.0025 and B_{12}=-0.0005. What will be the power loss?
f) Explain the dyanamicprogramming based unit commitment and state its advantages.
g) Draw the schematic diagram of a turbine speed governing system and explain its working. Give the complete block diagram of automatic load frequency in an isolated power system.
h) Explain the various components of a single area automatic load flow control (ALFC) loop and develop its block diagram.
i) Two generators rated 200MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load.Assuming that the generators are operating at 50Hz at no load, how would a load of 600MW be shared between them?What will be the system frequency at this load? Assume free governor operation. Repeat the problem if both governors have a droop of 4%.

j) Define and explain the terms(a) steady state stability (b) transient stability (c) steady state stability limit (d) transient stability limit

k) Show that two synchronous generating sources of inertia constants M_1 and M_2 respectively, and interconnected by means of a transmission line, may be regardea for purposes of stability studies as a single generator, of inertia constant $(M_1M_2)/(M_1+M_2)$, connected through the same transmission line to an infinite busbar.

l) What is transient stability and discuss the various factors affecting transient stability.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are the various load flow methods? Explain and compare all these methods stating the advantages and disadvantages of each of these methods. **(16)**

Q4 **a)** Explain the economic load dispatch as a constrained optimization problem and the method to solve it. **(6)**

b) The fuel cost of 3 thermal plants in \$/h are given as: $C_1=500+5.3P_1+0.004P_1^2$, $C_2=400+5.5P_2+0.006P_2^2$, $C_3=200+5.8P_3+0.004P_3^2$, P_1, P_2, P_3 are in MW. The total Load PD is 800 MW. Neglecting losses and generation limits, find the optimal dispatch and total cost in \$/h using a) analytical method and b) iterative method using gradient search **(10)**

Q5 Sketch and explain the block schematic of a two-area ALFC system. Define and explain Synchronizing Power Coefficient and Tie Line Bias Control, Discuss the significance of Area Control Error in a multi area system. **(16)**

Q6 Explain the concept of equal area criterion. How can it be used to study transient stability for a single machine infinite bus system , for the two different systems of operation i) sustained line fault ii) a line fault cleared after some time by tripping of the breakers at both ends. **(16)**