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

Total Number of Pages : 03 **B.Tech**

PEE6I102

6th Semester Regular / Back Examination 2018-19
POWER SYSTEM & OPERATION & CONTROL
BRANCH : ELECTRICAL
Max Marks : 100
Time : 3 Hours
Q.CODE : F217

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) What is the disadvantage of gauss seidel method?

b) What is the most prepared method for enhancing the power transmission in a long EHV transmission line?

c) Consider two buses connected by an impedance of (0+j0.5)Ω. The bus 1 voltage is $100\angle 30$ and bus 2 voltage is $100\angle 0$ V . What is the real and reactive power supplied by bus1?

d) When the newton rapshon method is applied to solve the equation $(x) = x^3 + 2x - 1 = 0$. What is the solution at the end of the first iteration with initial guess $x_0 = 1.2$?

e) A power system network consists of three elements 0-1,1-2 and 2-0 of per unit impedances 0.2,0.4 and 0.4 respectively. What is the bus impedance matrix?

f) The power generated by two plants are P1=50MW,P2=40MW. If the loss coefficients are B_{11}=0.001,B_{22}=0.0025 and B_{12}=-0.005. What is the power loss?

g) The per unit impedance of a synchronous machine is 0.242. If the base voltage is increased by 1.1 times then what is the per unit value?

h) What are the methods are using steady state stability limit of a power system?

i) What are the specified elements of a voltage control bus?

j) What is unit commitment?

Part- II

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

a) Derive the expression for step by step solution of swing equation?

b) Explain one application like sustained line fault occur by using of equal area criteria with neat sketch diagram ?

c) Incremental fuel costs for a power plant consisting of three generating units are $IC_1 = 20 + 0.3P_1$, $IC_2 = 30 + 0.4P_2$, $IC_3 = 30$, where P_i is the power in MW generated by unit i, i=1,2,3. Assume that all three units are operating all the time . Minimum and maximum loads on each unit are 50MW and 300MW respectively. If the plant is operating on economic load dispatch to supply the total power demand of 700MW. What is the power generated by each unit?

d) A 110kV, 100MVA turbo generator has the following specifications: No. of poles=4, frequency=50c/s. Moment of inertia=40*10^3 kg m2, speed=1500rpm. Calculate Kinetic energy, Inertia constant M and H. Also calculate Inertia constant on 40MVA base?

e) Derive the solution of economic load dispatch problem of a two generator system considering the transmission losses?

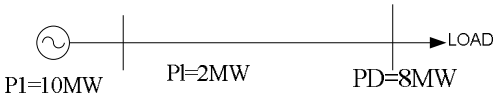
f) A synchronous motor is receiving 35% of power that is capable of receiving from an infinite bus. If the load on the motor is doubled, determine the maximum value of load angle δ during the swinging of the motor its new equilibrium point.

g) A generator operating at 50Hz delivers 1pu power to an infinite bus when a fault occurs and reduces the maximum power transfer to 0.4pu. The maximum power transferable before occurrence of fault was 1.75pu.The maximum power transferable after clearance of fault is 1.25pu. Compute critical clearing angle.

h) Write a short note of generator load model with block diagram of speed governing system?

i) Determine the incremental cost of received power and penalty factor of the plant shown in Fig. , if the incremental cost of production is

$$\frac{dF_1}{dP_1} = 0.1P_1 + 3\ Rs/\ MWhr$$



j) A two bus system ,if a load of 125MW is transmitted from plant 1 to the load , a loss of 15.625MW is insured. Determine the generation schedule and the load demand if the cost of received power is Rs.24/MWhr. Solve the problem using coordination equation and penalty factor method approach. The incremental production costs of plants are:

$$\frac{dF_1}{dP_1} = 0.025P_1 + 15$$

$$\frac{dF_2}{dP_2} = 0.05P_1 + 20$$

k) Discuss the factors affecting transient stability limit? How to improve it?

l) Write a short note ALFC modelling of two area system?

Part-III

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

Q3 A 50Hz four pole turbo generator rated 20MVA,13.2kV has an inertia constant of H=9kW-sec/VA. Determine the KE stored in the rotor at synchronous speed. Determine the acceleration if the input less the rotational losses is 25000Hp and electric power developed is 15000kW. 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 rpm at the end of 15 cycles? **(16)**

Q4 Using Gauss seidel method, find the bus voltage at the end of one iteration of the two bus system. Line reactances are j 0.1.Assuming initial bus voltage at all buses to $1\angle 0$ .use 1 as acceleration factor. The bus data is given in table **(16)**

Bus no.	Specified P (p.u)	Injection Q(pu)	Specified Volatge(pu)
1	-	-	1.0
2	0.3	-	1.0
2	0.5	0.2	-

Q5 A single area consists of two generating units rated 400 and 800 MVA with speed regulation of 4% and 5% of their respective rating. The units are operating are parallel sharing 700MW. Unit 1 supplies 200MW and unit 2 supplies 500MW at 1 per unit (60Hz) frequency. Load is increased by 130MW. Assuming no frequency dependent, find the new generation of each unit and steady state frequency deviation.(ii) D=0.804, find new generation of each unit and steady state frequency deviation. **(16)**

Q6 A two machine power system delivers a load of 25MW at 0.8 p.f lag and has double circuit. The system reactance 150% on 100MVA base. A sudden symmetrical line to ground fault occurs in one of the circuit which reduced the power to supplied to 40% which is subsequently cleared by the simultaneously action of the circuit breakers on both sides of the faulted line . Calculate on electrical degrees the critical clearing angle assumed that during fault condition the system reactance attains such a value that the maximum power becomes 30% of the normal maximum value when the faulty line is isolated the maximum power of the system becomes 60% of the normal maximum power. **(16)**