Enrollment No._____

NAVRACHANA UNIVERSITY
a UGC recognized University

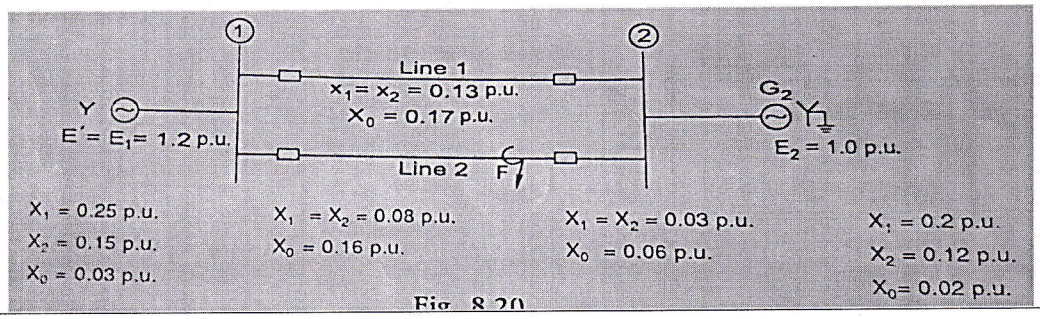
School: School of Engineering and Technology
Program/s: Electrical Engineering
Year: 4th **Semester:** 7th
Examination: End Semester Examination
Examination year: December - 2021

Course Code: EE 403 **Course Name:** **Power System Operation and Control**
Date: 03/12/2021 **Total Marks:** 40
Time: 2:30 pm to 4:30 pm **Total Pages:**

Instructions:

- *Write each answer on a new page.*
- *Use of a calculator is permitted.*
- ** COs=Course Outcome mapping. # BTL=Bloom's Taxonomy Level mapping*

Q. No.	Attempt Any Four:	Marks	COs*	BTL#
Q.1		10		
	Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governors are 4% and 5% respectively from no load to full load. The speed changers are so set that the generators operate at 50 Hz sharing the full load of 600 MW in the ratio of their ratings. If the load reduces to 400 MW, how will it be shared among the generators and what will the system frequency be? Assume free governor operation.		CO4	3,4
(b)	Explain with block diagram of turbine speed governing system of load frequency control (single area case).		CO1,CO4	1,2
Q.2	Unit 1 : Coal Fired Steam unit: 150 MW ≤ P1 ≤ 600 MW Input –Output Curve: H1 (MBtu\h) = 510.0 + 7.2 P1 + 0.0014 P12 Fuel cost = 1.1 R/MBtu Unit 2 : Oil Fired Steam unit: 100 MW ≤ P2 ≤ 400 MW Input –Output Curve: H2 (MBtu\h) = 300.0 + 7.95 P2 + 0.00194 P22 Fuel cost = 1.0 R/MBtu Unit 3 : Oil Fired Steam unit: 50 MW ≤ P3 ≤ 200 MW Input –Output Curve: H3 (MBtu\h) = 75.0 + 7.97 P3 + 0.00482 P32 Fuel cost = 1.0 R/MBtu Ploss = 0.00003 P12 + 0.00009 P22 + 0.00012 P32 Determine the economic operating point of these three units when delivering a total load of 1000 MW up to 3 iteration.	10	CO2	3,4,5

Q.3		10		
(a)	Explain Equal area criterion for transient stability and from that explain Effect of clearing time on stability.		CO3	1,2
(b)	A generator with constant excitation supplies 40 MW through a step up transformer and a high voltage line to an infinite bus bar. If the steady state stability limit of the system is 60 MW. Determine the maximum permissible sudden increase of generator output (resulting from sudden increase prime mover output) if the stability is to be maintained. Assuming resistance of generator, lines and transformers are neglected.		CO1,CO3	5,6
Q.4	In the double circuit network shown, a line to ground fault occur on one of double circuit transmission line at the point shown. Find the transfer reactance and maximum power transfer: (i) Before the fault occurs; (ii) While the fault exists and (iii) After the faulty line has been removed.  Fig. 8.20	10	CO3	3,4
Q.5		10		
(a)	Find the critical clearing angle for the system in which generator is delivering 1.0 pu power under pre fault condition. The motor is connected with generator with double circuit back to back transformer connected line. The generator reactance is 0.25 pu, motor reactance is 0.15 pu. The four transformer each having reactance of 0.15 pu and line having reactance of 0.3 pu. The fault occurs at 80% length from the generator bus bar on one of the double circuit line.		CO3	4,5,6

**********End of Question Paper**********