Hall Ticket Number:

Code No.: 21715

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

M.E. (EEE: CBCS) I-Semester Main Examinations, January-2019

(Power Systems & Power Electronics)

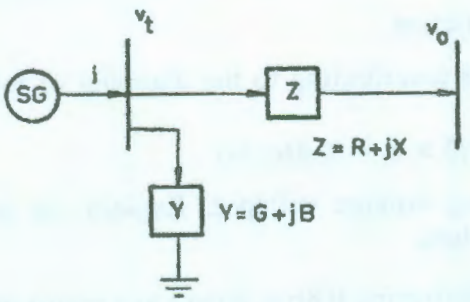
Power System Stability

Time: 3 hours Max. Marks: 60

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Q. No	Stem of the Question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	What is meant by steady state stability limit?	2	1	1	1,2
2.	Can power be transferred if the reactance of transmission line is zero? Justify the statement.	2	5	3	1,2
3.	Why does equal area criterion give only absolute stability of power system?	2	1	1	1,2
4.	List any two methods to improve the transient stability of a power system.	2	4	1	1,2
5.	What is the role of governor in hydraulic turbine?	2	1	1	1,2
6.	Draw the block diagram of tandem-compound single-reheat steam turbines.	2	2	1	1,2
7.	Write the necessity of supplementary damping system in a large power system.	2	1	3	1,2
8.	What is the role of supplementary excitation circuit in the operation of power system?	2	1	3	1,2
9.	Define torsional stiffness coefficient.	2	1	1	1,2
10.	What are the different sources contributing to the damping of torsional oscillations?	2	1	2	1,2
	Part-B (5 × 8 = 40 Marks)				
11. a)	What are the factors affecting voltage collapse. Explain the voltage stability relation with these factors.	4	2	2	1,2,3
b)	A generator rated 75 MVA is delivering 0.8p.u. power to a motor through a transmission line of reactance j 0.2 p.u. The terminal voltage of the generator is 1.0 p.u. and that of the motor is also 1.p.u. Determine the generator emf behind transient reactance. Find also the maximum power that can be transferred.	4	4	1	1,2,3
12. a)	Explain point-by-point method of solving swing equation.	4	2	2	1,2,3
b)	A 20MVA, 50 Hz generator delivers 18MW over a double circuit line to an infinite bus. The generator has K.E. of 3.0 MJ/MVA at rated speed. The generator transient reactance is $X_d' = 0.35$ p.u. Each transmission circuit has a reactance of 0.2p.u. on a 20MVA base. $\lvert E' \rvert = 1.1$ p.u. and infinite bus voltage is $V = 1.0\angle 0^0$. A three phase fault (short circuit) occurs at the mid-point of one of the transmission lines. Plot swing curve with fault cleared by simultaneous opening of breakers at both ends of the line at 6.25 cycles after occurance of fault.	4	4	1	1,2,3

Contd...2

13. a)	Derive transfer function of all the components of the Hovey's hydraulic power and governor system.	4	2	1	1,2
b)	Obtain the potential energy function for UPFC.	4	3	3	1,2
14. a)	Draw the transfer function block diagram for low-frequency oscillation studies based on a one-machine, infinite bus power system model with a local load. Write the relevant equations.	5	2	1	1,2
b)	Design the supplementary excitation block diagram for single machine infinite bus.	3	2	2	1,2,3
15. a)	Discuss about various problems associated to sub-synchronous torsional oscillations in detail.	5	6	2	1,2,3
b)	Write the shaft system equations for sub synchronous oscillation studies.	3	6	2	1,2,3
16. a)	Differentiate between steady state stability and transient state stability of power systems. Discuss the factors that affect the above stability.	4	4	2	1,2,3
b)	What is 'Equal Area Criterion'? How is it derived from the swing equation? Explain the operation of a synchronous motor using this criterion when sudden increase in mechanical load on that motor occurs.	4	1	1	1,2,3
17.	Answer any ***two*** of the following:				
a)	Draw and explain the hydraulic governors – electrical model for steam turbines.	4	2	1	1,2
b)	Find the initial steady-state value of the d and q component currents, voltages and the torque angle of the one-machine, infinite-bus system as shown in the figure below for given P_{eo}, $\lvert v_{to} \rvert$ and $\lvert v_{o} \rvert$ 	4	2	1	1,2,3
c)	List different methods for counteracting Sub Synchronous Resonance problems.	4	4	3	1,2,3

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	60.0
2	Knowledge on application and analysis (Level-3 & 4)	27.5
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	12.5