

Answer Key

<p style="text-align: center;">P.E.S. COLLEGE OF ENGINEERING (AN AUTONOMOUS INSTITUTE) CHH. SAMBAJINAGAR-431002 Regular Winter Examination – 2025</p> <p>Course: F.Y.M. Tech. Branch : Electrical Power System Semester : I Subject Code & Name: MEPS101T Power System Dynamics And Control Max Marks: 60 Date: Duration: 3 Hr.</p>			
<p>Instructions to the Students:</p> <ol style="list-style-type: none"> 1. All the questions are compulsory. 2. The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in () in front of the question. 3. Use of non-programmable scientific calculators is allowed. 4. Assume suitable data wherever necessary and mention it clearly. 			
		(Level/CO)	Marks
Q. 1	Solve Any one of the following.		
A)	Discuss classification of stability in terms of rotor angle & voltage stability view. <ul style="list-style-type: none"> • Definition of power system stability – 2 marks • Rotor angle stability (steady-state, transient, dynamic) – 5 marks • Voltage stability (short-term, long-term) – 5 marks 	L2/CO1	12
B)	Explain the concept of synchronizing power and damping power in the context of synchronous generator dynamics. <ul style="list-style-type: none"> • Synchronizing power concept & expression – 6 marks • Damping power concept & physical significance – 6 marks 	L2/CO1	12
Q.2	Solve Any one of the following.		
A)	Explain Small Signal Analysis with Characteristic Equation (CE) and Application of Routh-Hurwitz Criterion. <ul style="list-style-type: none"> • Small-signal stability concept – 3 marks • Characteristic equation derivation – 5 marks • Routh–Hurwitz criterion & application – 4 marks 	L3/CO1	12
B)	Discuss the stability analysis of a single-machine system using the equal area criterion. <ul style="list-style-type: none"> • Single-machine infinite bus system model – 4 marks • Equal area criterion explanation – 4 marks • Stability assessment using power–angle curve – 4 marks 	L4/CO1	12
Q. 3	Solve Any one of the following.		
A)	Define voltage stability and explain the factors affecting voltage instability and collapse. <ul style="list-style-type: none"> • Definition of voltage stability – 4 marks • Factors causing voltage instability – 4 marks • Voltage collapse explanation – 4 marks 	L2/CO1	12
B)	Describe the different types of PSS, including their advantages and disadvantages. <ul style="list-style-type: none"> • Types of PSS (conventional, multi-band, adaptive) – 6 marks • Advantages & disadvantages – 6 marks 	L2/CO1	12

Q.4	Solve Any one of the following.		
A)	<p>Explain the concept of electromechanical modes and their role in small-signal stability.</p> <ul style="list-style-type: none"> • Definition of electromechanical modes – 4 marks • Local and inter-area modes – 4 marks • Role in small-signal stability – 4 marks 	L2/CO1	12
B)	<p>Derive & Explain The Swing Equation.</p> <ul style="list-style-type: none"> • Assumptions and physical meaning – 4 marks • Mathematical derivation – 4 marks • Importance in stability studies – 4 marks 	L3/CO2	12
Q. 5	Solve Any one of the following.		
A)	<p>Explain the impact of controller gains and phase compensation on small-signal stability in power systems.</p> <ul style="list-style-type: none"> • Effect of controller gain on stability – 4 marks • Phase compensation concept – 4 marks • Impact on damping & system response – 4 marks 	L4/CO1	12
B)	<p>Draw & Explain AVR block diagram with excitation system.</p> <ul style="list-style-type: none"> • Neat AVR block diagram – 4 marks • Function of excitation system components – 4 marks • Role in voltage & stability control – 4 marks 	L3/CO1	12
	*** End ***		