Code : 1P6211

R11

M.Tech. I Semester Supplementary Examinations, July/August 2014

MODERN CONTROL THEORY
(EPE)

Time: 3 hours **Max Marks: 60**

Answer any FIVE of the following
All questions carry equal marks (12 Marks each)

* * * * *

1. a) Define the terms: (i) Field (ii) Vector (iii) Vector space 6M

   b) Find eigen values, eigen vectors and Jordan form reprasentation for the matrix:

$$A=\begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}$$ 6M

2. a) Obtain State Transition Matrix of $A=\begin{bmatrix} -6 & 1 & 0 \\ -11 & 0 & 1 \\ -6 & 0 & 0 \end{bmatrix}$ 6M

   b) State and prove various properties of State Transition Matrix. 6M

3. a) The following system:

$$\dot{x}(t)=\begin{bmatrix} 1 & e^{-t} \\ 0 & -1 \end{bmatrix}x(t); y(t)=\begin{bmatrix} 1 & 1 \end{bmatrix}x(t)$$

   Is observable at t=0? If yes, find x(0) when $y(t)=e^{t}$. 6M

   b) Find the observable canonical form of the state model:

$$\dot{x}(t)=\begin{bmatrix} -2 & 1 \\ 1 & -2 \end{bmatrix}x(t)+\begin{bmatrix} 1 \\ 0 \end{bmatrix}u(t);\ y(t)=\begin{bmatrix} 1 & -1 \end{bmatrix}x(t)$$ 6M

4. a) What is meant by 'non-linearity'? Explain in detail various properties of non-linear systems. 6M

   b) What is the role of Describing function in non-linear systems analysis? Explain. 6M

5. A linear second order servo is described by the equation: $\ddot{e}+2\xi\omega_n\dot{e}+\omega_n^2 e=0$. Where, ξ=0.15, ω_n=1 rad/sec, e(0)=1.5 and $\dot{e}(0)$=0. Determine the singular point. Construct the phase trajectory using the method of Isoclines. 12M

6. a) Derive the condition for stability of a linear continuous time autonomous system $\dot{x}=Ax$ using second method of Lyapunov. 6M

   b) For the non-linear system:

$\dot{x}_1=-x_1-x_2^2; \dot{x}_2=-x_2$, Find a region of asymptotic satbility using Krasovskii method. 6M

7. Find a three dimensional observer with eigenvalues -2,-2,-3 for the system:

$$\dot{x} = \begin{bmatrix} -1 & -2 & -2 \\ 0 & -1 & 1 \\ 1 & 0 & -1 \end{bmatrix} x + \begin{bmatrix} 2 \\ 0 \\ 1 \end{bmatrix} u; y = \begin{bmatrix} 1 & 1 & 0 \end{bmatrix} x$$

12M

8. Explain the following Optimal control problems in detail:
   (a) Minimum-Time problem
   (b) Minimum-Energy problem
   (c) Minimum-Fuel problem
   (d) State regulator problem

12M

***

Code : 1P6214

R-11

M.Tech. I Semester Supplementary Examinations, July/August 2014

REACTIVE POWER COMPENSATION & MANAGEMENT (EPE & EPS)

Max. Marks: 60 **Time: 03 Hours**

****

Answer *any five* questions
All Questions carry equal marks (12 Marks each)

1.	a)	Explain the load compensator as a voltage regulator.	6M
	b)	Explain reactive power characteristics.	6M
2.		Explain passive shunt and series compensation in detail.	12M
3.		Explain the effect of static series compensation and synchronous condensers.	12M
4.	a)	Write the objectives of reactive power planning and Discuss about concepts of quality of power supply.	6M
	b)	Explain the effect of under voltages and frequency for reactive power coordination.	6M
5.		What are the different load patterns available and also explain the basic methods of load shaping	12M
6.	a)	Explain the objectives of reactive power planning	4M
	b)	Explain different loss reduction methods in distribution systems.	8M
7.	a)	Explain the KVAR requirements for domestic appliances	6M
	b)	Write the factors for selecting the capacitor location.	6M
8.	a)	Explain about electric arc furnace and what is importance of filters in arc furnace	6M
	b)	Discuss the various types of railway electric system with neat diagrams.	6M

****

Code : 1P6217

R-11

M.Tech. I Semester Supplementary Examinations, July/August 2014

ADVANCED POWER SYSTEM ANALYSIS
(EPE & EPS)

Max. Marks: 60 **Time: 03 Hours**

****

Answer *any five* questions
All Questions carry equal marks (12 Marks each)

1. For the graph(fig-1) of a network shown find Zbus by taking bus-1 as reference.
The P.U. reactance are as follows(neglect resistances)

Self reactances	Mutual reactances
x_{12} =0.1 P.U	x_{be} =0.1 P.U
x_{13} =0.5 P.U	x_{bf} =0.2 P.U
x_{23} =0.4 P.U	
x_{25} =0.2 P.U	
x_{54} =0.3 P.U	

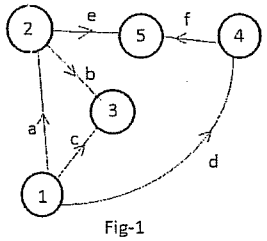

Fig-1

12M

2. a) Explain the word sparse and the use of sparsity matrices in power system calculations 4M

   b) Explain briefly the various schemes of sparsity and optimal loading 8M

3. Explain de-coupled and fast de-coupled methods of load flow analysis 12M

4. Using symmetrical components derive the equations for fault current and bus voltages for 3-phase to ground fault. 12M

5. Explain the bus impedance matrix method for the analysis of an L-G-fault using Thevenen's equivalent and derive necessary equations. 12M

6. a) Explain the optimal power flow in detail 4M

   b) Explain the non-linear programming technique in conjunction with the 1st order gradient method. 8M

7. a) Explain the factors influencing transient stability 4M

   b) Explain the Euler's method of transient stability analysis 8M

8. a) What is power system security 4M

   b) Briefly explain the various functions present in security analysis 8M

****

Code : 1P6213

R-11

M.Tech. I Semester Supplementary Examinations, July/August 2014

EHV AC/DC Transmission
(EPE & EPS)

Max. Marks: 60 **Time: 03 Hours**

****

Answer *any five* questions
All Questions carry equal marks (12 Marks each)

1. a) Give the standard transmission voltages formulated all over the world. Discuss the need for transmitting electrical energy by EHVAC lines
   b) Calculate the GMR of the bundle conductor having 8 sub conductors in that bundle, 0.6 m bundle radius and sub conductor diameter is 4.6 cm.
2. For a 400 KV line, calculate the maximum surface voltage gradients on the centre and outer phases in horizontal configuration at the max. operating voltage of 420 KV r.m.s (line to line). The other dimensions are: H=14 m, S=12 m N=2 r=0.016 m B=0.46 m.
3. Explain the voltage control in EHV A.C. lines by using shunt and series compensation method.
4. What is audible noise? How they are generated and explain their characteristics and limits?
5. a) Compare the power transfer capacities of AC and DC transmission systems when an existing AC line is converted into DC line, with following conditions:
      i) Same current and insulating level.
      ii) Same percentage losses and insulating level
   b) With the help of neat sketches explain different types of DC links available
6. a) Explain why it is desirable to have current control at rectifier side and CEA control at inverter station with neat converter controller characteristics.
   b) Derive the expression for AC harmonics of a 12-pulse converter using Fourier analysis. Neglect overlap and assume that direct current ripple free.
7. a) From the fundamentals, develop the equivalent circuit for the HVDC Transmission system.
   b) Explain the rectifier and inverter operation in HVDC transmission.
8. a) Explain voltage stability problem in AC /DC system.
   b) How the DC power modulation is achieved in AC/DC systems?

****