Hall Ticket Number :										

R14

Code: 4P6211

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Modern Control Theory

(*Common to EPE & EPS*)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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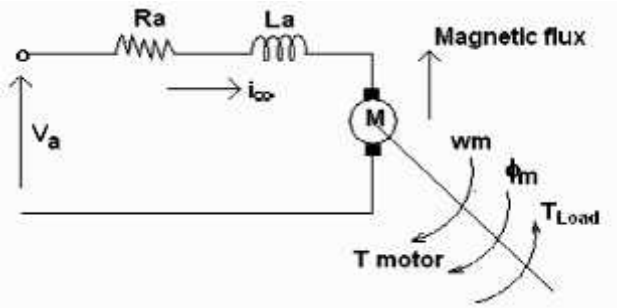
UNIT-I

1. a) Define vector spaces and what the significance of linear transformation is.
   b) Explain the advantages of state variables representation.

OR

2. a)



Obtain the state space model of a given dc motor.

   b) Define the terms
      i) State
      ii) State space
      iii) State equation
      iv) State vector
      v) State diagram

UNIT-II

3. a) Derive the solution of Non-homogeneous state equations
   b) Given the state model of a system

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$
$$y = [1 \quad 0]x.$$

With initial conditions

$$x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

Determine the state transition matrix.

OR

4. a) Define controllability and Give the Kalman Test.
   b) Test controllability following system.

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix}; \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}; \quad C = [1 \quad 0 \quad 0]$$

UNIT-III

5. a) Explain the process of observable canonical form for the state model.
   b) Obtain the Observable canonical form of the system given below:

$$\dot{X}(t)=\begin{pmatrix}-1 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{pmatrix}X(t)+\begin{pmatrix}0\\0\\2\end{pmatrix}u(t)$$

$$Y(t)=\begin{pmatrix}1 & 0 & 0\end{pmatrix}X(t)$$

OR

6. a) What is the effect of Pole Placement by state feedback?
   b) Design a full order state observer by representing it in the form of block diagrams.

UNIT-IV

7. a) Explain the construction of a phase trajectory by isocline method.
   b) What is a describing function? Explain how an element with dead-zone can be analyzed using describing function method.

OR

8. a) Explain the following non-linearties
      i) Saturation and
      ii) Dead-zone.
   b) Define singular point. Draw the phase trajectories for different Eigen values and singular points.

UNIT-V

9. a) Define Lyapunov stability, instability and Asymptotic stability.
   b) Consider the second order system described by

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}0 & 1\\ -1 & -1\end{bmatrix}\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}$$

The equilibrium state is the origin. Determine the stability of this state.

OR

10. a) State and explain the principle of optimality.
    b) Obtain the Hamilton Jacobi equation for the system described by

$\dot{x}=u(t)$,

subjected to the initial condition $x(0)=X^0$

Find the control law that minimizes

$$J=\frac{1}{2}x^2(t_1)+\int_0^{t_1}(x^2+u^2)\,dt,\ t_1 \text{ specified}$$

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Hall Ticket Number :										

R14

Code: 4P6213

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

EHV AC/DC Transmission

(*Common to EPE & EPS*)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. a) Explain the advantages of bundle conductors. 4M

   b) Calculate the GMR of the bundle conductor having 8 sub conductors in the bundle, 0.6 m bundle radius and sub conductor diameter is 4.6 cm. Derive the formulae used. 8M

OR

2. The dimensions of the 3-phase, 220 kV horizontal line shown in the figure (1) are H= 15 m, S = 11 m phase separation, Conductor is 2x3.18 cm diameter, Bundle spacing B= 45.72 cm. Calculate the matrix of inductance and capacitance per km for transposed and un transposed lines.

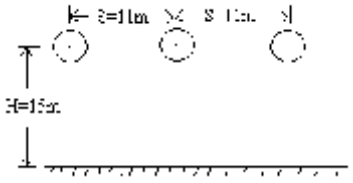

Figure (1) 12M

UNIT-II

3. a) Discuss the effect of high electro static field on biological organisms and human beings. 6M

   b) Derive the expression for maximum voltage gradient of 'n' sub conductor bundle. 6M

OR

4. Derive the expression for voltages induced in the un energized conductors of a 3-phase double circuit line when one circuit is energized and the other is un energized. 12M

UNIT-III

5. a) What is audible noise? Explain its characteristics and limits. 6M

   b) What is mean by attenuation of voltage on traveling waves? Explain. 6M

OR

6. a) Briefly discuss the corona loss formulae 6M

   b) Explain the generation of audible noise due to corona 6M

UNIT-IV

7. Explain the individual characteristics of a rectifier and an inverter with neat sketches. 12M

OR

8. Give reasons for selecting star-star and star-delta transformer configuration instead of two star-star configurations for 12 pulse converter. Derive equation for primary current. 12M

UNIT-V

9. a) With a schematic diagram, explain the concept of constant current control of HVDC converters. 6M

   b) Discuss harmonic instability problems in HVDC systems. 6M

OR

10. Discuss about various types of AC filters that can reduce the harmonics. 12M

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Hall Ticket Number :										

R14

Code: 4P6214

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Reactive Power Compensation and Management

(*Common to EPE & EPS*)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. a) Explain about inductive approximate biasing. 6M
   b) Explain about reactive power characteristics 6M

OR

2. a) Illustrate with an example, load compensator as a power factor correction of un symmetrical loads. 6M
   b) Clearly discuss the various type of loads requiring compensation and state the specification for load compensation. 6M

UNIT-II

3. a) Discuss the objectives and limitations of series compensators. 6M
   b) Explain the different characteristic time periods for transient reactive power compensation. 6M

OR

4. a) Explain the passive and active compensators. 6M
   b) What is meant by uncompensated line? Explain in detail. 6M

UNIT-III

5. Explain the effect of the following on power quality.
   i. Under voltages
   ii. Frequency
   iii. Harmonics 12M

OR

6. a) Explain operation planning strategies of reactive power coordination. 6M
   b) Explain how the penalties are given for voltage flickers and harmonic voltage levels. 6M

UNIT-IV

7. a) Explain the deciding factor for selection of capacitors for reactive power management at the user side. 6M
   b) Explain about the system losses in a distribution system. 6M

OR

8. a) Discuss about KVAr requirements for domestic appliances. 6M
   b) Explain about economic planning of capacitor placement. 6M

UNIT-V

9. a) Explain the basic operation of any one type of electric arc furnace 6M
   b) Draw & explain typical layout of traction system. 6M

OR

10. a) Discuss about distribution transformers for reactive power management in detail. 6M
    b) What are the remedial measures to be taken in the operation of arc furnace? 6M

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Hall Ticket Number :										

R14

Code: 4P6216

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Power Quality

(Common to EPE & EPS)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT–I

1. a) Explain the following terms
   i) Voltage swells
   ii) Voltage flicker
   iii) Voltage sags and
   iv) Voltage interruptions. 6M

   b) Write the Remedies to improve power quality and write the causes for power quality. 6M

OR

2. a) Explain the various types of power quality disturbances and its impact on power quality. 6M

   b) Write the Limits for the Interruption frequency and Limits for the interruption duration. 6M

UNIT–II

3. a) Explain voltage sag characteristics such as magnitude, phase angle jump, point on wave initiation and point on wave recovery. 6M

   b) What are short interruptions and explain their causes. 6M

OR

4. Explain different methods about estimating the voltage sag performance. 12M

UNIT–III

5. Explain the effect of voltage sags on dc bus voltage and causes of equipment tripping in ac drives. Also discuss the effect of sag on ac current and motor terminal voltage. 12M

OR

6. a) Explain the effect of voltage sags on adjustable speed of AC drives and its operation. 6M

   b) Explain the effect of voltage sags on adjustable speed of DC drives and its operation. 6M

UNIT–IV

7. a) Explain various utility mitigation measures for voltage sags. 6M

   b) Explain the effects of harmonics on power system equipment's and load. 6M

OR

8. Distinguish between harmonics and transients. Explain the different harmonic sources from various types of loads in detail. 12M

UNIT–V

9. Explain the various categories of PQ monitoring instruments and their function in detail. 12M

OR

10. a) Describe the methods of PQ data measurement. 6M

    b) Explain the design approach of an autonomous expert system for PQ data assessment with application example. 6M

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Hall Ticket Number :										

R14

Code: 4P7211

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Power System Control & Stability

(*Electrical Power Systems*)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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UNIT-I

1. a) Discuss the effect of excitation system on transient stability
   b) Briefly explain Classical model of multi machine system

OR

2. a) Clearly explain Classical model of one machine connected to an infinite bus
   b) Derive the equation, which describes the motion of a synchronous machine

UNIT-II

3. a) Clearly explain about unregulated synchronous machine
   b) Explain the effect of excitation on dynamic stability and examination of dynamic Stability by Routh's criterion.

OR

4. a) Explain the effects of small changes of speed on a multi machine system.
   b) Clearly explain examination of dynamic stability by Routh's criterion

UNIT-III

5. a) Clearly explain basic concepts applied to Power System Stabilizer
   b) Discuss about the excitation system response for continuously regulated systems

OR

6. a) Explain control signals used for Power System Stabilizer
   b) Explain the effect of excitation on generator performance

UNIT-IV

7. a) Compare the different types of excitation systems and give the applications of each type
   b) Explain about Popoll's method of stability of nonlinear systems

OR

8. a) Explain excitation system static with terminal potential and current supplies, and also derive state equations.
   b) Explain Lyapunov method based on first integrals

UNIT-V

9. a) Briefly discuss comparison between angle stability and voltage stability
   b) Explain the concept of voltage instability and collapse

OR

10. a) Explain clearly about voltage stability
    b) Explain the importance of continuation power flow analysis

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Hall Ticket Number :										

R14

Code: 4P6217

M.Tech. I Semester Regular & Supplementary Examinations Feb/Mar 2016

Advanced Power System Analysis

(Common to EPE & EPS)

Max. Marks: 60 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 12 = 60 Marks)

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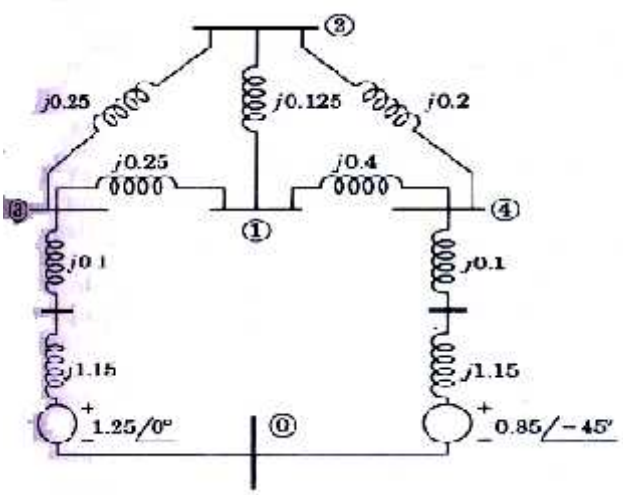
UNIT-I

1. A single line diagram of a power system is shown in figure. Develop nodal admittance matrix and find Y_{BUS} for the power system. All values are given in p.u Reactance



12M

OR

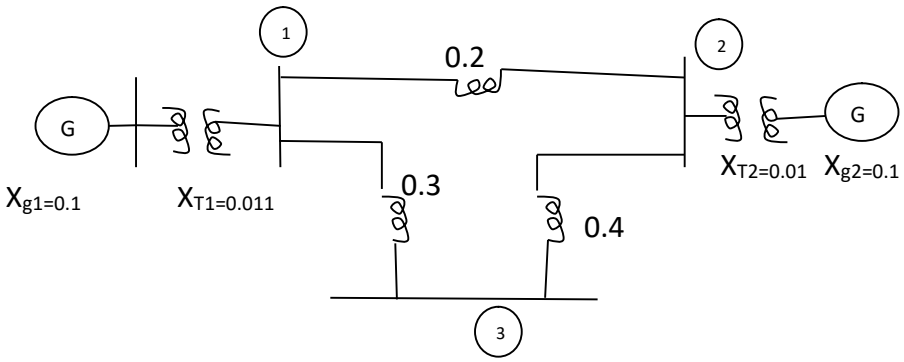
2. Explain the following with examples
   a. Node elimination method 6M
   b. Triangular factorization 6M

UNIT-II

3. Explain the algorithm for formation of Z_{BUS} for addition of link, which is mutually coupled with other elements 12M

OR

4. By using Z_{BUS} building algorithm form bus impedance matrix for power system shown, all reactance's are in p.u values



UNIT-III

5. Explain clearly with a flow chart the computational procedure for load flow solution using Newton-Raphson (polar co-ordinates) method when the system contains all types of busses

OR

6. a) Classify various types of buses in a power system for load flow studies. Justify the classification 5M

   b) Compare the performances of Gauss-Seidal method and Newton-Raphson method 7M

UNIT-IV

7. Determine step by step procedure to compute fault currents and voltages during sort circuit faults using Bus Impedance matrix 12M

OR

8. By using symmetrical components analyze the following types of faults for a fault impedance of z_g
   a. Three phase to ground fault
   b. Line to Line fault 12M

UNIT-V

9. Explain fourth order Range-Kutta method for transient stability analysis? 12M

OR

10. Write an algorithm for simulation of SMIB and multi machine system 12M

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