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BIEEE-007

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00845

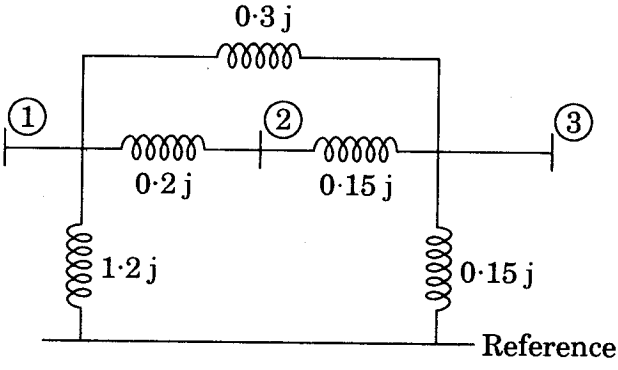
December, 2014

BIEEE-007 : COMPUTER APPLICATIONS IN POWER SYSTEMS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Assume missing data, if any. Use of scientific calculator is allowed.*

1. Determine Z_{Bus} for the network shown, where impedances are shown in per unit. *10*



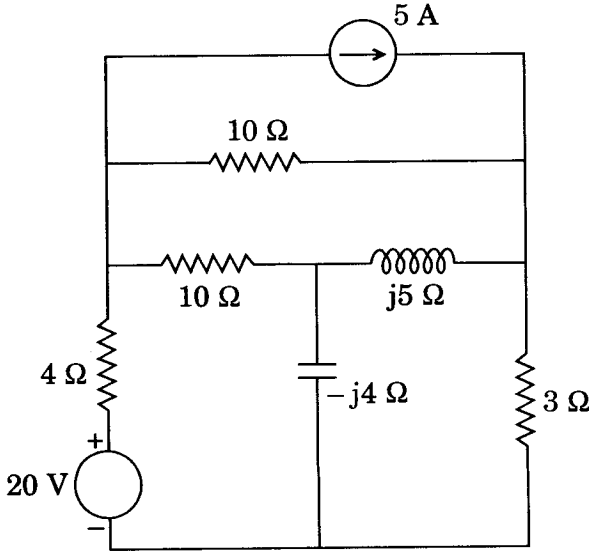
2. Explain automatic generation control using block diagram to illustrate the operation of a computer controlling a particular area. *10*

3. Give a flow chart for a load flow study using Newton-Raphson method. How does the method get modified when PV buses are also present ? *10*

4. A three-phase transmission line is feeding from a 23/230 kV transformer at its sending end. The line is suppling a 150 MVA, 0·8 power factor load through a step down transformer of 230/23 kV. The impedance of the line and transformer at 230 kV is (18 + j 60) Ω. The sending end transformer is supplied from 23 kV supply. Determine the tap settings for each transformer to maintain the voltage at the load at 23 kV. *10*

5. Explain the contingency analysis for interconnectors. *10*

6. For the network in the figure given below draw network graph. Obtain loop incidence matrix and loop equations. *10*



7. A system consist of two plants connected by a transmission line. The only load is located at plant 2. When 200 MW is transmitted from plant (1) to plant (2), power loss in the line is 16 MW. Find the required generation for each plant and the power received by the load when λ for the system is 12·5 Rs per mega watt hour. Assume that the incremental fuel cost can be approximated by the following equations :

$$\frac{dF_1}{dP_1} = 0{\cdot}010\ P_1 + 8{\cdot}5 \text{ Rs/MWh}$$

$$\frac{dF_2}{dP_2} = 0{\cdot}015\ P_2 + 9{\cdot}5 \text{ Rs/MWh} \qquad \textit{10}$$

8. Explain Gauss-Seidel method for load flow solution using nodal admittance approach for the formulation of load flow equations. *10*

9. Write short notes on any ***two*** of the following : *2×5=10*

   (a) Tap changing transformer

   (b) Optimum scheduling of thermal plants

   (c) Demand side management of power system

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BIEEE-008

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00245

December, 2014

BIEEE-008 : FLEXIBLE AC TRANSMISSION SYSTEM

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Assume suitable data, if missing.*

1. (a) Explain the various factors limiting the loading capability of a transmission line. 5

(b) An industrial three-phase load bus draws power of (100 + j50) kVA. If the bus voltage is 400 V (L – L), find the compensator rating per phase. What is the compensator susceptance ? 5

2. (a) Discuss how reactive power control is possible by controlling the magnitude of voltage. 5

(b) What are the various advantages of FACTS devices ? 5

3. (a) Explain the working principle and VI characteristics of a STATCOM. 5

(b) Discuss the method of voltage control by SVC. 5

4. Explain the working principle of TCR with necessary waveforms and operating characteristics. 10

5. (a) Draw VI characteristics and loss characteristics for (i) TCSC and (ii) SSSC. 5

(b) Explain the basic concept of voltage regulator with the help of a phasor diagram. 5

6. What is UPFC ? Explain how UPFC is different from a simple voltage source converter. Give the block diagram for a basic UPFC control scheme. 10

7. (a) Give the block diagram of a generalized IPFC. 5

(b) By means of a block diagram simulate a generalized IPFC which can be operated as a STATCOM, UPFC or IPFC. 5

8. Discuss briefly the following custom power devices : $4 \times 2\frac{1}{2} = 10$

(i) STS

(ii) SSC

(iii) SVR

(iv) UPQC

9. (a) With the help of a diagram, explain the working of a series connected dynamic break and also list its advantages. *5*

(b) Draw the circuit of a thyristor controlled voltage limiter and discuss its functioning. *5*

10. Write short notes on any ***two*** of the following : *2×5=10*

(i) TCPAR

(ii) Thyristor controlled current limiter

(iii) Generalized and multifunctional FACTS controllers

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BIEEE-009

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00465 **December, 2014**

BIEEE-009 : DIGITAL CONTROL SYSTEM DESIGN

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. All questions carry equal marks. Use of scientific calculator is permitted. Missing data, if any may be suitably assumed and mentioned.*

1. Draw and explain the configuration of the basic digital control system. What are the advantages and disadvantages of digital control systems ? *10*

2. Derive the mathematical model for Zero-Order Hold (ZOH) and First-Order Hold (FOH) operation. *10*

3. Briefly explain the Jury stability criteria with necessary conditions for stability. *10*

4. (a) What is the effect of addition of poles on the root locus ? Explain with the help of suitable examples. *5*

(b) Explain the procedure for construction of Bode diagram for discrete time systems. *5*

5. (a) Using r-transformation followed by the Routh stability criterion, find the number of poles of the following transfer function that lie inside the unit circle on the z-plane.

$$G(z) = \frac{3z^4 + 2z^3 - z^2 + 4z + 5}{z^4 + 0{\cdot}5z^3 - 0{\cdot}2z^2 + z + 0{\cdot}4}$$ *5*

(b) State and explain the Nyquist stability criterion with example. *5*

6. How is transfer function converted into canonical state variable mode using Phase-variable method ? *10*

7. (a) Using the Cayley-Hamilton technique, find e^{At} for

$$A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}$$ *5*

(b) Explain the concept of controllability and observability of discrete time control system. *5*

8. Evaluate the state variable model of the given transfer function G(s) with the help of Jordan canonical method :

$$G(s) = \frac{s+3}{(s+2)^2(s+5)}$$

Also draw the state diagram of the model. *10*

9. (a) Consider the system shown in Figure 1. Find the range of values of "K" for which the system is stable using Jury's table : *5*

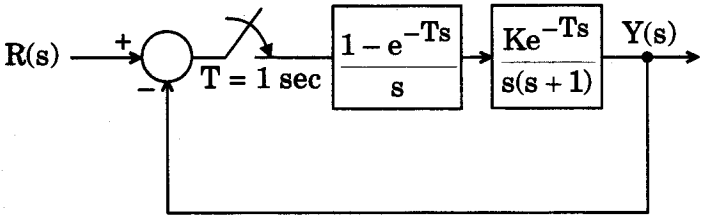

Figure 1

(b) What are the properties required to characterise the dead-beat response design ? *5*

10. Draw and explain the block diagram of PID controller. Differentiate non-interacting and interacting PID controllers in brief. *10*

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BIEEE-010

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

00645 **December, 2014**

BIEEE-010 : POWER SYSTEM RELIABILITY

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. What is a generator system model ? Draw and explain state load model used in a power system analysis. *10*

2. What is power outage ? What are the various factors responsible for an outage ? *10*

3. What is an interconnected system ? Write the advantages of an interconnected system. Define variable reserve and maximum peak load reserve for an interconnected system. *2+4+4*

4. Discuss probability array methods for reliability analysis of interconnected systems. *10*

5. What do you understand by operating reserve ? Explain outage replacement rate (ORR). Draw the generation model used in PJM method. *2+4+4*

6. Explain the various factors affecting the emergency assistance available through interconnections. *10*

7. Describe security function approach for the rapid start of generating units. *10*

8. Describe the various basic evaluation techniques for a radial distribution system. *10*

9. Explain in brief, the effect of lateral distribution protection, disconnects, protection failures and transferring load in case of a radial distribution system. *10*

10. Write short notes on any ***two*** of the following : *2×5=10*

    (i) UC risks

    (ii) Multi-connected systems

    (iii) Interruption indices
