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EIGHTH SEMESTER **B.E. (EE)**

MID SEM EXAMINATION ***March*** **2006**

EE-411 POWER SYSTEM STABILITY

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer ***ALL*** questions.
Assume suitable missing data, if any.

1[a] Distinguish between steady state, transient and dynamic stability. Derive swing equation. **3**

[b] How is the swing equation solved using Runge-Kutta method. **4**

2[a] What is the equal area criterion to assess the transient stability of power system. **3**

[b] A large 3 phase cylindrical rotor generator is delivering 1.0 p.u power to an infinite bus through a transmission network. The maximum power which can be transferred for pre-fault, during fault, and post fault conditions is 1.8 p.u, 0.4 p.u. and 1.3 p.u respectively. Find the critical clearing angle. **4**

3 How can the transient stability be improved? Give the various approaches used. **6**

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EIGHTH SEMESTER B.E. (EE)

MID SEM EXAMINATION ***March*** **2006**

EE-412 CONTROL SYSTEM

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer ***ALL*** questions.
Assume suitable missing data, if any.

1[a] The simultaneous equations relating the two input controls, $u_1(t)$ and $u_2(t)$, and the two output variables, $y_1(t)$ and $y_2(t)$ are given by

$$\ddot{y}_1 + 3\dot{y}_1 + 2y_2 = u_1$$
$$\ddot{y}_2 + \dot{y}_1 + y_2 = u_2$$

Draw the block diagram. Also derive the state model for the above equations. 3

[b] Consider the following rational transfer function where the degree of the numerator polynomial is same as that of the denominator polynomial. 3

$$\frac{Y(s)}{U(s)} = \frac{2s^3 + 10s^2 + 21s + 23}{s^3 + 5s^2 + 7s + 10}$$

Derive the state model.

2[a] A single input single output system is given as

$$\begin{bmatrix} \dot{x}_1(t) \\ \dot{x}_2(t) \\ \dot{x}_3(t) \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ x_3(t) \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} u(t) \qquad 4$$

$$y(t) = \begin{bmatrix} 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} x_1(t) \\ x_2(t) \\ x_3(t) \end{bmatrix}$$

Draw the block diagram. Determine controllability and observability of each state variable without using Kalman's and Gilbert's test.

[b] Given $L_1 = \begin{bmatrix} m & 0 \\ 0 & m \end{bmatrix}$; $L_2 = \begin{bmatrix} 0 & w_1 \\ -w_1 & m \end{bmatrix}$; $L = \begin{bmatrix} m & w_1 \\ -w_1 & m \end{bmatrix}$

Compute state transition matrix for L. 3

3[a] Using the Leverrier's algorithm find the transfer function for following system.

$$\dot{X} = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -2 & 0 \\ 1 & 1 & -1 \end{bmatrix} X + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \end{bmatrix}$$

$$\text{and} \begin{bmatrix} y_1 \\ y_2 \end{bmatrix} = \begin{bmatrix} 2 & 1 & -1 \\ 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$ 3

[b] Write the state variable formulation of the circuit shown in Fig.1. 4

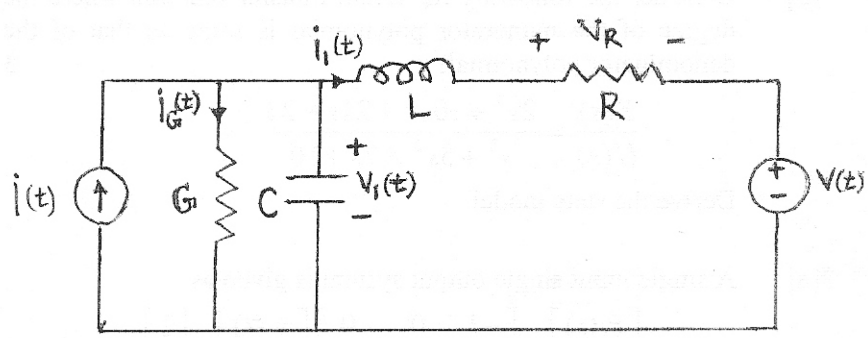

Fig.1

Where G is conductance of the branch. L, R and C are inductance, resistance and capacitance resp.

Outputs are $i_G(t)$ and v_R (t). Inputs are i(t) and v(t).

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EIGHTH SEMESTER B.E. (EE)

MID SEM EXAMINATION ***March 2006***

EE-413 HIGH VOLTAGE ENGINEERING

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer ***ALL*** questions.
Assume suitable missing data, if any.

1[a] Justify: Electrons are good ionizers of gas, while ions are not. **2**

[b] Explain why the impulse breakdown voltage is higher than the power frequency breakdown voltage for a gaseous gap subjected to a uniform field. **2**

2 What is vaccum? Discuss the various mechanisms of vaccum breakdown. **4**

3 What are delay cables? Explain how a delay cable is connected to a resistive voltage divider. Also explain how a resistive voltage divider is used for the measurement of impulse voltages. **4**

4[a] What are the differences in design considerations between power transformer and a testing transformer. **2**

[b] Draw equivalent circuit of a 3-stage cascaded transformer and determine the expression for short circuit impedance of the transformer. Hence deduce an expression for the short circuit impedance of an n-stage cascaded transformer. **3**

5 A four-stage Cockroft-Walton type cascade circuit with capacitances all equal to 0.05 μF is fed from 150 kV. If 1.7 mA of current is to be supplied to the load by this circuit, determine

(i) the ripple, (ii) the voltage drop (iii) regulation, if the supply frequency is 150 Hz. 3