COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Computer Control Engineering

Lecturer : Prof. Ahmed F. Amer

Course : Electrical Engineering II

Course Code : EE 326 Marks : 40

Date : 9 / 1 / 2016 Time : 2 hours

Answer Four Questions Only:

Question One: (10 marks)

(a) Explain briefly using a neat sketch the general configuration of a control system showing the different control components of the loop and the function of each component.

(b) Find the overall transfer function C(s)/R(s) for the given closed-loop system shown in Fig.1 below.

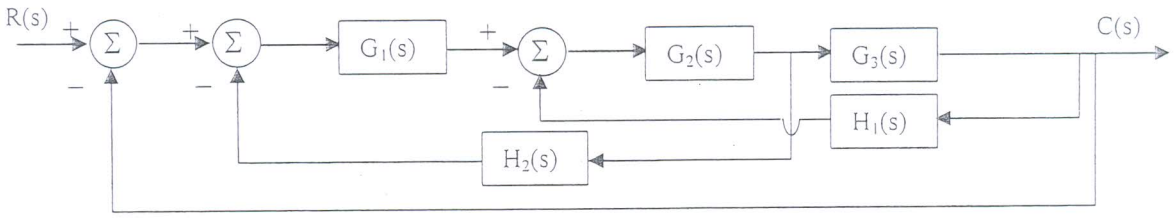

Fig.1

Question Two: (10marks)

(a) An R-C circuit has a resistance of 500 kΩ and a capacitor of 100 μF is shown in the circuit given below, determine:

i) The circuit transfer function $V_o(s)/V_i(s)$.

ii) Circuit time constant.

iii) Draw the output voltage for a step input voltage of 100V.

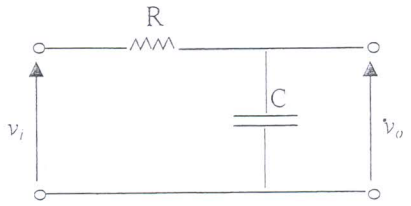

Fig.2 R-C electric circuit

Members of course Examination Committee	Signature	Date
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(b) The mass-spring-damper mechanical system shown in Fig.3 has a mass m, kg, a spring of stiffness k_s, N/m and a damper of damping coefficient b, N/m/sec. If a unit-impulse force is applied to the system as shown in figure below:

- Obtain the system differential equation.
- Determine the system transfer function.
- If m=1 N/m/sec^2, b=4 N/m/sec, and k_s=13 N/m, obtain the natural frequency and the damping factor of the system.
- If b=0, find the system response for an impulse function.

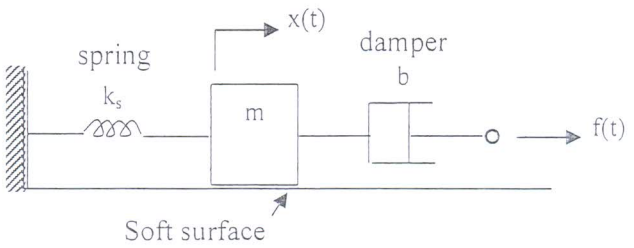

Fig. 3 A spring-mass-dashpot mechanical system

Question Three:

(a) Explain briefly the idea of D.C. (d'Arsonval) moving coil meter and show how it can be used to measure different ranges of voltages.

(b) An ammeter is used to measure d.c. currents. It has an internal resistance (meter resistance, R_M) of 105 Ω and the maximum coil current is 10 mA. Calculate the required shunt resistors to measure different ranges of currents of 25mA and 200mA.

Question Four:

(a) Draw neat sketches for the different types of d.c. generators.

(b) A dc shunt motor has an armature resistance of 0.01Ω runs at 1000 rpm. The supply voltage is 250 V and the shunt field resistance is 250Ω. The input power equals 6.5 kW. The supply voltage is reduced to 230 V and the field resistance is reduced to 125Ω. Find the new speed to keep the motor torque constant.

(c) A 25 kVA single-phase transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary winding is connected to a 3000 V, 50 Hz supply. Find the full-load primary and secondary currents, and the secondary emf induced voltage. Neglect leakage drops and no load current (i.e., consider an ideal transformer).

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