Code: DE15 **DECEMBER 2008** **Subject: CONTROL ENGINEERING**
Time: 3 Hours **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Question 1 is compulsory and carries 20 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following: (2x10)

a. The transfer function of any system is defined as the ratio of

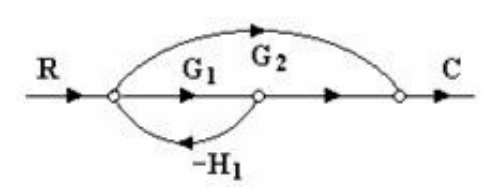
(A) output to input considering initial conditions as zero.
(B) Laplace transform of input to laplace transform of output considering initial conditions to zero.
(C) Laplace transform of output to laplace transform of input considering initial conditions as zero
(D) Laplace transform of output to laplace transform of input

b. A closed loop system is

(A) less accurate **(B)** easy to build
(C) may become unstable at times **(D)** stability can be ensured

c. In force-voltage analogy, velocity is analogous to

(A) current **(B)** charge
(C) inductance **(D)** capacitance



d. Transfer function for the given signal flow graph is

(A) $\frac{G_1+G_2}{1+G_1H_1+G_2H_1}$ **(B)** $\frac{G_1+G_2}{1+G_1H_1}$

(C) $\frac{G_1G_2}{1+G_1H_1+G_2H_1}$ **(D)** $\frac{G_1+G_2}{1+G_2H_1}$

e. For the system $\frac{C(s)}{R(s)} = \frac{25}{s^2 + 6s + 25}$, the damping factor ξ and damped frequency of oscillations ω_d respectively will be

(A) 0.6, 4 **(B)** 0.4, 6
(C) 0.5, 3 **(D)** 0.3, 5

f. For input $r(t) = 2$, the steady output for the transfer function $\frac{C(s)}{R(s)} = \frac{1}{s^2 + 1.5s + 4}$ is

(A) 0 **(B)** 0.5
(C) 1.5 **(D)** 2

g. The characteristic equation of a system is given as

$$2s^3 + 4s^2 + 4s + K = 0$$

the system is stable if

(A) $K > 12$ **(B)** $K = 12$
(C) $K > 3$ **(D)** $K < 8$

h. The initial slope of the Bode plot for a type 2 system with Bode gain(K) intersects 0dB axis at

(A) $\omega = 0$ **(B)** $\omega = K$
(C) $\omega = \sqrt{K}$ **(D)** $\omega = K^2$

i. In order to increase the damping of a badly underdamped system which of the following compensator may be used?

(A) Phase lead **(B)** Phase lag
(C) Both **(A)** and **(B)** **(D)** None of the above

j. The break away points of the root locus occur at

(A) Imaginary axis
(B) Real axis
(C) Multiple roots of characteristic equation
(D) None of the above

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2 a. Obtain the overall transfer function for the signal Flow Graph shown in Fig.2. **(8)**