Rajiv Kumar

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-2

B.Tech. ECE, 5th Sem.

COURSE NAME: CONTROL SYSTEMS MAX. MARKS: 25

COURSE CODE: 18B1WEC531 MAX. TIME: 1.5 Hr

Note: Using of mobile phone in examination shall be treated as a case of unfair means.

Q-1: (a) Explain the following time response specifications: (CO-3)
(i) Delay time, (ii) Rise time, (iii) Peak time, (iv) Settling time **[4]**

(b) The unity feedback system is characterized by an open loop transfer function is

$$G(s) = \frac{K}{s(s+10)}$$

Determine the gain K,so that the system will have a damping ratio of 0.5. (CO-3) **[3]**

Q-2: (a) Measurements conducted on a servomechanism show the system response to be

$$c(t) = 1 + 0.2e^{-60t} - 1.2e^{-10t}$$

When subject to a unit-step input, obtain the expression for the closed-loop transfer function. (CO-3) **[4]**

(b) Draw the unit step response for the following second order systems for the following cases: (i) underdamped, (ii)overdamped system (CO-3) **[2]**

Q-3: (a) Define stability of system with giving example.

(b) What do you mean by the marginal stability?

(c) Explain the Routh Hurwitz Criterion of stability. (CO-4) **[1.5+1.5+2=5]**

Q-4: (a) Find the roots of the characteristic equations for systems whose open loop transfer function is $G(s)H(s) = \frac{1}{(s+2)(s+4)}$. Locate the roots in the s-plane and indicate the stability of system. (CO-4) **[3]**

(b) By means of the Routh criterion, determine the stability of the systems represented by the following characteristic equation: (CO-4)

$$s^6 + 3s^5 + 5s^4 + 9s^3 + 8s^2 + 6s + 4 = 0$$ **[2]**

(c) Draw root locus (without using root-locus technique) of the system whose open loop transfer function is $G(s)H(s) = \frac{K}{(s+2)}$ (CO-4) **[2]**