Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
(A Constituent Institute of Manipal University)
Manipal – 576 104

VI SEMESTER B.Tech (BME) DEGREE MAKE-UP EXAMINATIONS JUNE/JULY 2016

SUBJECT: PHYSIOLOGICAL CONTROL SYSTEM (BME 322)
(REVISED CREDIT SYSTEM)
Wednesday, 29th June, 2016, 2 to 5 pm

TIME: 3 HOURS **Note: Answer any FIVE full questions** **MAX. MARKS: 100**

Q1 (a) Discuss the differences between physiological and technological control systems with examples 8

(b) With a suitable model obtain the differential equations of distribution of Creatinine in human body system 8

(c) Write a note on dynamic response of pupil system. 4

Q2 (a) Explain with the block diagram, the regulation of Calcium ion concentration in the extracellular fluid of human body. 8

(b) Briefly discuss on the processes of heat loss of human body. 8

(c) Draw the model of mechanical section of the human heart and briefly discuss on it. 4

Q3 (a) Discuss on the open loop and closed loop control system with one example each. 8

(b) Obtain unit step response and steady state error for a first order system. 6

(c) Determine the position, velocity and acceleration error constants and steady state errors for the following open loop transfer function of a control system with unity feedback. 6

$$G(s) = \frac{50}{(1+0.1s)(1+2s)}$$

Q4 a) For the mechanical system shown in **Fig. Q4a**, write the system differential equations. Also obtain analogous force to current and force to voltage electrical circuit and write the corresponding equations. 10

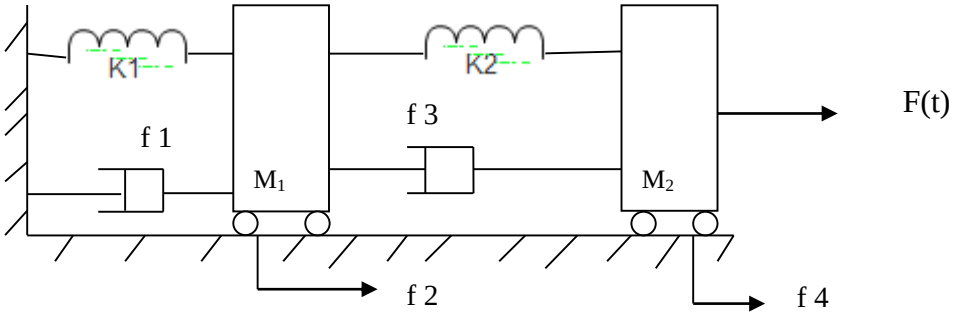
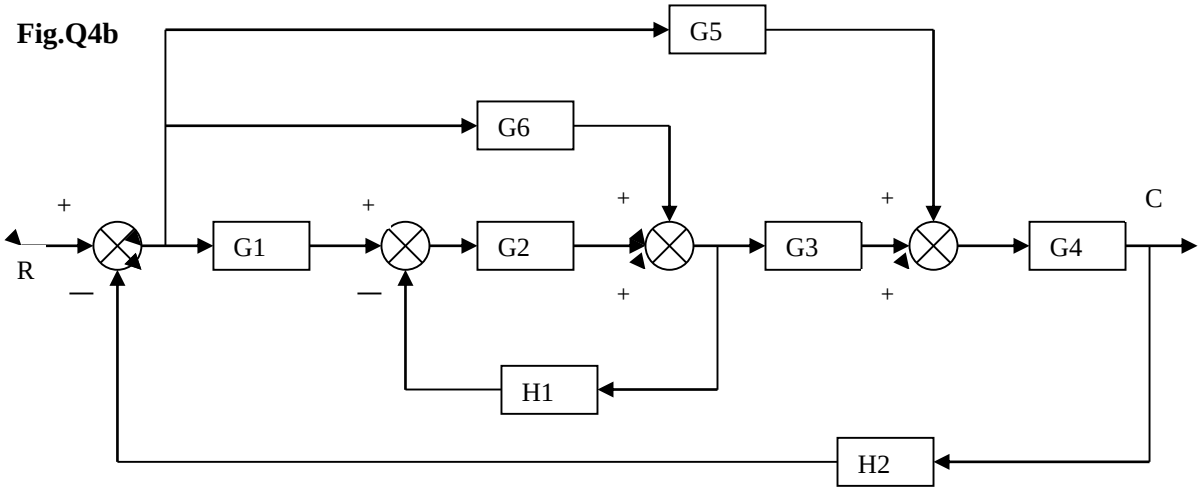


Fig.Q4a

b) (i) Discuss the significance of Masons gain formula used for finding the transfer function of feedback control system. 2

(ii) For the system shown in **Fig.Q4b**, find C/R using SFG technique. 8

Fig.Q4b



Q5 (a) The characteristic equation for certain feed-back control system is given below. Using RH criterion, determine the range of values of K for the system to stable. Also find the frequency of oscillation where the system just becomes unstable. 8

$$s^4 + 5s^3 + 5s^2 + 4s + K = 0$$

(b) A unity feedback control system has the characteristic equation 12

$$s^2(s+9) + K(s+1) = 0$$

Sketch the root locus diagram of the system for K ≥0 and discuss the stability of the system.

Q6 (a) Discus on gain margin and phase margin. A unity feedback control system has the open loop transfer function 14

$$G(s)H(s) = \frac{100(1+0.1s)}{s(1+s)^2(1+0.01s)}$$

Construct the Bode plot, find gain margin, phase margin and discuss on the stability of the system.

(b) The characteristic equation of a certain feedback control system is given below. Using RH criterion determine the stability of system. 6

$$s^5 + s^4 + 2s^3 + 2s^2 + 3s + 5 = 0$$