B.TECH SEM – V (2007 COURSE) (BIOMEDICAL ENGG.) :
WINTER - 2017
SUBJECT: CONTROL SYSTEMS

Day: **Tuesday** Time: **02.30 PM TO 05.30 PM**
Date: **16/01/2018** **W-2017-2486** Max. Marks: 80

N.B.:

1) Q.1 and Q.5 are **COMPULSORY**. Out of the remaining attempt any **TWO** questions from each section.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Answers to both the sections should be written in **SEPARATE** answer book.

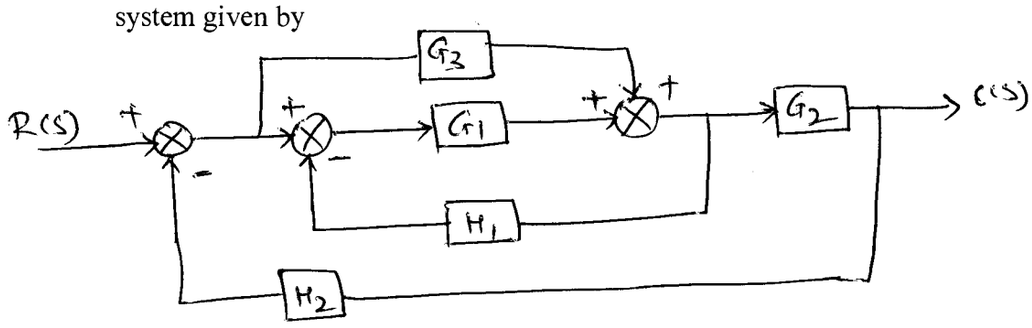
SECTION – I

Q.1 **a)** Compare open loop and closed loop system. **(05)**

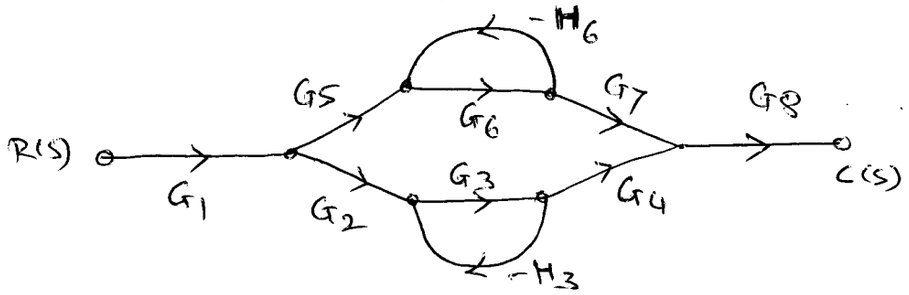
b) State and explain Mason's gain formula. **(04)**

c) Define : i) Delay time , **(05)**
ii) Rise time,
iii) Peak time.
iv) Settling time ,
v) steady state error (e_{ss}).

Q.2 **a)** Using block diagram reduction technique obtain transfer function $\frac{C(s)}{R(s)}$, for **(07)** system given by



b) Obtain transfer function for a given S.F.G. **(06)**



Q.3 **a)** For $G(s).H(s) = \frac{10(s+1)}{s^2(s+2)(s+10)}$, determine k_p, k_v, k_a and steady state error **(07)** for input $1+3t+\frac{t^2}{2}$.

b) A unity feedback system has $G(s) = \frac{500}{s(s+15)}$, determine : **(06)**

i) ω_n, ω_d **ii)** ξ, T_d, T_p, T_s and **iii)** $\%M_p$.

P.T.O.

Q.4 **a)** Define 'order of system'. Differentiate between first order and second order system. For a first order system, when unit step input is applied then find the output of the system. **(07)**

b) Define stability. Explain the effect of addition of poles and zeros on stability of system. **(06)**

SECTION – II

Q.5 **a)** Explain Routh's criterion and determine stability of system : **(07)**
$F(s) = s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16$

b) Draw a bode plot for unity feedback control system with $G(s) = \frac{10}{s(0.1s+1)}$. **(07)**

Q.6 **a)** State and explain Nyquist stability criterion. **(07)**

b) Sketch the Nyquist stability plot for unity feedback system with **(06)**
$G(s) = \frac{20}{s(1+0.1s)(1+0.5s)}$

Q.7 Define gain margin and phase margin. Find gain margin and phase margin for a system given by $G(s).H(s) = \frac{10}{s(s+1)(s+10)}$ **(13)**

Q.8 **a)** Describe servomotors in detail. **(07)**

b) Describe "Error detector", with suitable diagram. **(06)**

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