6TH SEM./ ELECTRICAL/2022(S)

TH-3 Control System Engineering

Full Marks: 80   Time- 3 Hrs

Answer any **FIVE**Questions including Q No.1& 2

Figures in the right hand margin indicates marks

1.   Answer **All** questions   2 x 10
   a.   What is signal flow graph?
   b.   Define phase margin. Is it positive or negative for stable feedback systems?
   c.   What do you mean by velocity error constant?
   d.   Define(i)Gain cross over frequency (ii) Resonant frequency, in frequency domain analysis.
   e.   What is the time response to unit ramp input in first order system?
   f.   What is corner frequency in Bode plot?
   g.   Define (i) Impulsesignal (ii) Transfer function.
   h.   What are the open loop poles of G(s).H(s) $= \frac{12(s+1)}{s(s+4)(s+5)}$?

   i.   What do you mean by all pass system?
   j.   What are the advantages of polar plot?

2.   Answer **Any Six** Questions   6 x 5
   a.   Explain the effects of feedback in a closed loop control system.
   b.   What are the basic properties of signal flow graph?
   c.   Derive the damped natural frequency from the time responseof second-order system to the unit step signal.
   d.   Describe about the PI controller using Block Diagram briefly.
   e.   Write a brief note on Constant-M circles with the help of polar plot.
   f.   An unity feedback control system has an open loop transfer function:
        G(s)= $\frac{K}{s(s^2+4s+13)}$.Find the (i) Centroid of asymptotes(ii) Breakaway point.
   g   Explain the effect of addition of poles and zeros to G(S).H(S) on the shape of Nyquist plot.

3   Explain all the rules for reduction of Block diagram, used in control systems in details.   10
4   Explain about the Nicholas Chart used in frequency response analysis briefly.   10
5   Describe about the construction and working ofAC servomotors in details with the help of a neat diagram.   10
6   Describe the properties, advantages, disadvantages of transfer function in details.   10
7   Derive the expression for rise time, peak time, peak overshoot for second order systems   10