

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV EXAMINATION – SUMMER 2016

Subject Code:141701**Date:06/06/2016****Subject Name:Control Theory****Time:10:30 AM to 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Write short notes on open loop control systems and closed loop control systems. Discuss their advantages and disadvantages. **07**
- (b) Write definitions of state and state variables. Derive expression of transfer function of the system which is represented in the following standard state space form:
 $\dot{X} = AX + BU$ And $Y = CX + DU$ **07**
- Q.2** (a) Define Following Terms. **07**
 (1) Regenerative feedback (2) Analogous system (3) Self Loop (4) Source Node (5) Rise Time (6) Settling Time (7) Peak Time
- (b) Explain constant-M circles and constant-N circles by deriving related expressions. Explain how resonant peak can be obtained. **07**
- OR**
- (b) Describe effects of integral and derivative controls on the performance of control systems. **07**
- Q.3** A unity Feedback system has open loop Transfer Function, Obtain its Root Locus. **14**
 $G(s)H(s) = K (S+1) / S(S-1)(S^2 + 4S+16)$.
- OR**
- Q.3** Sketch Bode plot for the transfer function given below. Determine from gain margin and phase margin also. Comments on stability. **14**
 $G(s) = 64 (S+2) / S(S+0.5)(S^2 + 3.2S+64)$.
- Q.4** (a) Explain Standard Test signals & derive equation of steady state error. Discuss steady state error constants also. **07**
- (b) Explain Force current analogy, with equation and sketches. **07**
- OR**
- Q.4** (a) Write a technical note on Gear train. Derive its governing Equation also. **07**
- (b) Discuss Nyquist's stability criterion. Explain with example. **07**
- Q.5** (a) Discuss the various stability approaches/criteria and types. **07**
 By means of Routh criterion, determine the range of K for stability of the system described by characteristic equation, $S^3 + 8S^2 + 2S + 4K = 0$
- (b) Sketch the polar plot of following the transfer function, $G(s) = 1 / S(S+1)(1+2S)$. **07**
 Determine whether these plot cross the real axis or not. If yes, determine the Frequency and corresponding magnitude.
- OR**
- Q.5** (a) Enumerate & explain the different MATLAB command used in control system engg./tool box/ field, with examples and syntax. **07**
- (b) Using block diagram reduction technique find the closed loop transfer function of the system whose block diagram is given in figure below. **07**

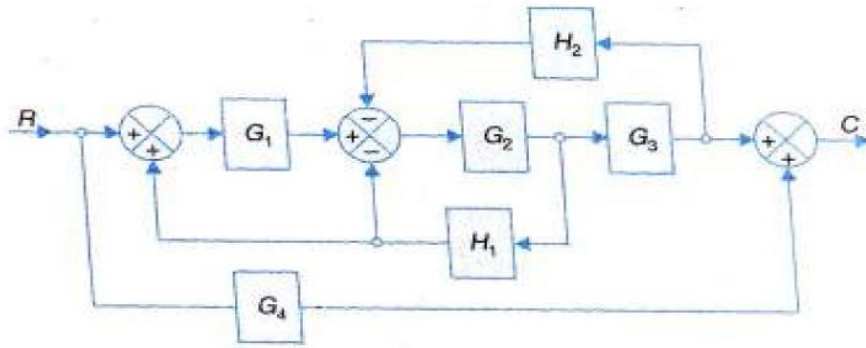


FIGURE FOR QUE :5 (B) OR
