## GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2016 Code:2160104 Date:13/05/2016

Subject Code:2160104

Subject Name: Basic Control Theory

Time: 10:30 AM to 01:00 PM

Instructions:

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- Q.1 (a) Explain the difference between open loop and closed loop control system.
  - (b) Explain Mason's gain formulae in detail.
- Q.2 (a) Find the transfer function of the system given below through block diagram reduction method: 07



- (b) Draw the root locus for the following system. G(s) H(s) =K/s(s+1) (s+3). Also find the value 07 of K.
  OR
- (b) Sketch the root locus of the following system shown in figure below:



- Q.3 (a) Explain the following terms in detail (1) Peak Overshoot (2) Rise Time (3) Settling Time 07 (4) Peak Time. Draw the graph indicating these parameters.
  - (b) Define steady state error and also calculate the steady state error for Type-0,1,2 with step, 07 ramp and parabolic inputs.

OR

Q.3 (a) Obtain the transfer function from signal flow graph of the system given below: 07



(b) The characteristic equation of the feedback system is

Total Marks: 70

07

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07

Using Routh's Hurwitz criteria determine the stability of the system.

- Q.4 (a) Explain Frequency response specifications in detail.
  - (**b**) A unity feedback system has

$$\mathbf{G}(\mathbf{s}) = \underline{\mathbf{K} (\mathbf{s} + 1)}$$

Using Routh's Hurwitz criteria find the range of K for closed loop system to be stable.

OR

Q.4 (a) Draw the bode plot of the system

$$G(s)H(s) = \frac{100}{S(S+1)(S+2)}$$

100

Find the Gain Margin, Phase Margin, Phase crossover frequency and Gain cross over frequency.

- (b) Explain the difference between manmade control system and natural control system. 07
- **0.5** (a) Explain the classification of different types of controllers.

(b) Explain PI controller in detail.

## OR

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- Q.5 (a) Explain the PID controller in detail.
  - (b) Speed control of servo motor is open loop control system or closed loop control system. Justify 07 your answer with proper diagram.

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