

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:3160104****Date:06-07-2023****Subject Name:Basic 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.
4. Simple and non-programmable scientific calculators are allowed.

**MARKS**

- Q.1** (a) Define control system. Classify control system on different basis. **03**  
 (b) What is transfer function? Discuss properties, advantages, and disadvantages of it. **04**  
 (c) Explain Open loop and Closed loop control system with examples. **07**
- Q.2** (a) Explain Mason's gain formula. **03**  
 (b) Compare block-diagram and signal flow graph method. **04**  
 (c) Explain rules for block-diagram reduction technique. **07**
- OR**
- (c) Discuss characteristics of an ideal control system, **07**
- Q.3** (a) Explain the conditions for Stable, marginally stable and Unstable systems. **03**  
 (b) Discuss standard Test signals used in control system. **04**  
 (c) Explain Routh's criterion to check the stability of a system. **07**
- OR**
- Q.3** (a) Define following terms. **03**  
 1) Rise time 2) Settling time 3) Peak time  
 (b) Discuss Hurwitz's stability criteria. **04**  
 (c) Explain steady state error in detail. **07**
- Q.4** (a) Discuss Nyquist criteria for stability. **03**  
 (b) Write a short note on PID controller. **04**  
 (c) Explain rules for construction of root locus. **07**
- OR**
- Q.4** (a) Explain concept of Relative stability. **03**  
 (b) Write a short note on state space representation of a control system. **04**  
 (c) Describe Correlation between transfer function and state space equations with suitable examples. **07**
- Q.5** (a) Define: (i) State (ii) State Variable (iii) State Vector **03**  
 (b) Define the following terms. **04**  
 1) Gain cross over frequency 2) Phase cross over frequency  
 3) Gain Margin 4) Phase Margin  
 (c) Explain steps to plot Bode plot. **07**
- OR**
- Q.5** (a) Explain ON-OFF controller. **03**  
 (b) List Advantages of State variable analysis **04**  
 (c) Explain phase lag compensator in detail **07**

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