

GANPAT UNIVERSITY

B. Tech. Semester: VI Mechanical Engineering

Regular Examination } April - June 2015

2ME601 CONTROL SYSTEM ENGINEERING

Total Marks: 70

Time: 3 Hours

Instruction:

- 1). All questions are **compulsory**.
- 2). Figures to the **right** indicate full marks.
- 3). Answers to the two sections must be written in **separate** answer books.
- 4). Assume all necessary data.

Section - I

Que. - 1 Attempt all. **12**

- A Determine the equations for various static error coefficients. Also discuss the disadvantages of the static error coefficients. **4**
- B Derive the equation for unit step response of a first order system. **4**
- C Discuss all the rules for block diagram reduction. **4**

OR

Que. - 1 Attempt all. **12**

- A Derive the equation for unit ramp response of a first order system. **4**
- B Discuss the time domain specifications with appropriate sketch. **4**
- C Explain the time response of second order system subjected to unit impulse input for damping ratio greater than one and damping ratio less than one. **4**

Que. - 2 Attempt all. **11**

- A Explain in detail the procedure to draw the bode plot. **6**
- B For $G(s) = 10 (s + 1) / s^2 (s + 2) (s + 10)$ determine error constants and steady state error for input $1 + 3t + t^2/2$ **5**

OR

Que. - 2 Attempt all. **11**

- A Discuss the relation between steady state error and type of a system in detail. **6**
- B Construct a polar plot for given transfer function: **5**

$$G(s) = 200 / (s+1)(s+3)$$

Que. - 3 Attempt all. **12**

- A Classify the control system in detail. **4**
- B Find stability using routh's criterion: **4**
- $G(s) = 100 / (S^4 + 6S^3 + 30S^2 + 60S + 100)$
- C Explain in detail all the standard test signals with its need. **4**

Section – II

- Que. – 4 Attempt all. 12
- A Describe the requirements of a good control system. 4
 - B Define transfer function. Prove that for an impulse input, the response equals the transfer function. 4
 - C Define Poles and Zeros of Transfer function. Show them in diagram by taking proper example. 4
- OR
- Que. – 4 Attempt all. 12
- A What is translational motion? Derive equations for elements of translational motion. 4
 - B Write a short note on RTD. 4
 - C Define closed loop control system. Draw its general block diagram and explain missile launcher control system. 4
- Que. – 5 Attempt all. 11
- A What is analogous system? Derive equations for Force-Voltage analogy and Force-Current analogy. 6
 - B What is SFG? Explain some of its terms. Write down steps to solve SFG using Mason's Gain Formula. 5
- OR
- Que. – 5 Attempt all. 11
- A Explain air energy production and consumption system in pneumatics with suitable line diagram. 6
 - B Describe all the basic components of Pneumatic system. 5
- Que. – 6 Attempt all. 12
- A Write down properties, advantages and disadvantages of transfer function. 4
 - B Explain the feed forward control system with diagram and example. 4
 - C Differentiate between OLCS and CLCS. 4

END OF PAPER