## Question Paper For Internal Assessment Examination (Theory) - Credit 4 / 51 /

**Instructions for Students/FacultyMid Term I (Total 80 Marks, 2 HRS. Syllabus from Unit-1)**

- Part A: Total number of questions to be given are ten (5 from CO1 and 5 from CO2), each carrying 2 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 20 marks.
- Part B: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 5 marks. Total 20 marks.
- Part C: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2). They are numerical answer type / fully elaborative type (**Not More Than 70 Words for Question)** *, each carrying 10 marks. Total 40 marks.

**Mid Term II (Total 120 Marks, 2.5 HRS., Syllabus from Unit-2)**

- Part A: Total number of questions to be given are ten (5 from CO3 and 5 from CO4), each carrying 4 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 40 marks.
- Part B: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 7 marks. Total 28 marks.
- Part C: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student has to answer four (2 from CO3 and 2 from CO4). They are numerical answer type / fully elaborative type (**Not More Than 70 Words For Question)** *, each carrying 13 marks. Total 52 marks.

**Mid Term III (Total 120 Marks, 2.5 HRS., Syllabus from Unit-3)**

- Part A: Total number of questions to be given are ten (5 from CO5 and 5 from CO6), each carrying 4 marks and are compulsory to attend. There is no choice. They are short answer type questions (**Not More Than 25 Words For both Question & Answer)**, no objective type or fill in the blanks. Total 40 marks.
- Part B: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student must answer four (2 from CO5 and 2 from CO6). They are long answer type (**Not More Than 50 Words for Question)**, each carrying 7 marks. Total 28 marks.
- Part C: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student must answer four (2 from CO5 and 2 from CO6). They are numerical answer type / fully elaborative type (**Not More Than 70 Words for Question)** *, each carrying 13 marks. Total 52 marks.

*** LIST OF ELABORATIVE THEORY QUESTION SUBJECTS**: NO SUBJECT UNDER CREDIT FOUR

**Instructions For Faculties:**

There should be total 6 Course Outcomes (COs) for each subject.

- Mid Term Question Papers are to be submitted as per Course Outcomes (COs) which should be divided equally in Part A, Part B and Part C according to Mid Term Examination and Credit Point.
- In Mid Term-1, the questions are to be given from CO1 and CO2. In Mid Term-2, the questions are to be given from CO3 and CO4. Similarly, in Mid Term-3, the questions are to be given from CO5 and CO6.

- **FACULTY MEMBERS, PLEASE ENSURE EXCEPT ABOVE LISTED SUBJECTS, NO THEORITICAL ELABORATIVE QUESTION SHOULD BE GIVEN IN PART 'C' OF QUESTION PAPER**

**INSTRUCTION FOR STUDENTS**

- **STUDENT IS ALLOWED TO ENTER LATE NOT MORE THAN 15 MIN AFTER STARTING OF EXAM, AND MAY LEAVE THE EXAM HALL ON EXPIRY OF ATLEAST OF 1 Hr FROM THE STARTING TIME OF EXAMINATION.**

**QUESTION PAPER AND STUDENTS DETAILS**

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| **Type of Exam** | Mid Term 3 | **Date of Submission** | 19/08/2021 |
| **Name of Faculty** | Ms. Tarun Thukral | **Date of Examination** | 25/08/2021 |
| **Course** | B.Tech (Mechatronics Engineering) | **Semester** | SEMESTER : 4 |
| **Batch** | Fifth (5) | **Subject** | 4 MH4 - 07 Control System (Cr 4) |

**COURSE OUTCOMES FOR REFERENCE TO FRAME QUESTION PAPER**
**(Faculties are required to mention relevant Course Outcome number against the respective question in QP)**

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| **Course Outcome** | 1 Student will learn about the basic concepts of control system, its mathematical modelling and reduction techniques.<br>2 Student will learn about the time response of first and second order system, its steady state analysis and PID controllers.<br>3 Student will learn about the frequency domain analysis of different control systems.<br>4 Student will learn about the different criterion of stability mechanisms of control systems.<br>5 Student will learn about the compensation techniques of lead, lag and lead-lag network.<br>6 Student will learn about the different control system design problems with the help of matlab. | | |
| **Email I'd** | tarunthukral@soaneemrana.org | **Phone No.** | 750-096-6580 |
| **Student Name** | | **Student Reg No.** | |

## Part A

**All the questions are compulsory to attend.**

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| **1. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 5 |
| **Question : 1** | Define compensation. | | |
| 34 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 2** | Define phase lag compensation. | | |
| 34 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |

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| **Question : 3** | Define phase lead compensation. | | |
| 35 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 4** | Write the need of compensator. | | |
| 34 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 5** | Define phase lag-lead compensation. | | |
| 36 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **2. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 6 |
| **Question : 6** | Define Matlab. | | |
| 37 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 7** | Define script. | | |
| 37 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 8** | Define variable, arguments and returns. | | |
| 37 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 9** | Explain the representation of numbers in MATLAB. | | |
| 38 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 10** | Write the applications of MATLAB. | | |
| 40 | MATLAB applications | Automatic Control System by S Hasan Saeed | |

## Part B

**FOR MIDTERM 1 - Part B**: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2).
**FOR MIDTERM 2 - Part B**: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student must answer four (2 from CO3 and 2 from CO4).
**FOR MIDTERM 3 - Part B**: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6).

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| **3. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 5 |
| **Question : 1** | Design phase lag compensation. | | |
| 34 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 2** | Design phase lead compensation. | | |
| 35 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 3** | Design lead-lag compensator using Bode plot. | | |
| 36 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **4. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 6 |
| **Question : 4** | Find the roots using Matlab H(s) = (s^2 – 2^s + 1)/(s^3 + 3s^2 + 4s + 2) | | |
| 37 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 5** | The closed loop transfer function of a system is s^2 + 9s +19/s^3 +7s^2 + 14s +8.Determine the unit<br>step response of the system using MATLAB. | | |
| 38 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 6** | Sketch the Nyquist plot of G(s) = 90 / (s+3)(s+6) using MATLAB. | | |
| 39 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 7 (Old Pattern)** | | | |
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## Part C

**FOR MIDTERM 1 - Part C**: Total number of questions to be given are six (3 from CO1 and 3 from CO2), out of which student must answer four (2 from CO1 and 2 from CO2).
**FOR MIDTERM 2 - Part C**: Total number of questions to be given are six (3 from CO3 and 3 from CO4), out of which student must answer four (2 from CO3 and 2 from CO4).
**FOR MIDTERM 3 - Part C**: Total number of questions to be given are six (3 from CO5 and 3 from CO6), out of which student has to answer four (2 from CO5 and 2 from CO6).

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| **5. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 5 |
| **Question : 1** | Design a lead compensator for a system whose open loop transfer function is G(s) = 4 / s(s+2) to meet the following specifications damping ratio 0.5 and natural frequency is 4 radian per sec. | | |
| 36 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 2** | Design a suitable lag compensating network for G(s) = K / s(s+2)(s+20) to meet the following specifications i.e velocity error coefficient is 20 per sec nd phase margin is greater than or equal to 35 degrees. | | |
| 34 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **Question : 3** | The open loop transfer function of a unity feedback is G(s) = K / s(1+0.2s). It is required velocity error constant should be at least 20 and phase margin should be 45 degrees. Does the system meet the required specifications. If not, design the compensating network to satisfy the required specifications. | | |
| 35 | COMPENSATION DESIGN | Automatic Control System by S Hasan Saeed | |
| **6. CHOOSE COURSE OUTCOME (CO) NUMBER ACCORDING TO THE TYPE OF MIDTERM, AS PER INSTRUCTIONS ABOVE.** | | | 6 |
| **Question : 4** | Sketch the root locus for G(s) = K(s+1) / s^2(s+3.6) using MATLAB. | | |
| 38 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 5** | Sketch the bode plot for the transfer function G(s) = 1000 / (1+0.1s)(1+0.001s) | | |
| 39 | MATLAB applications | Automatic Control System by S Hasan Saeed | |
| **Question : 6** | Design a lag compensator for a system whose open loop transfer function is G(s) = K / s(s+1)(s+4) to meet the following specifications damping ratio 0.5, settling time 10 sec and velocity error constant is greater than equal to 5. | | |

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| 40 | MATLAB applications | Automatic Control System by S Hasan Saeed | |

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| **Upload Scanned Document In Case of Numerical or Diagram For Any of The Above Questions.** *(Mention question number with relevant fig / numerical / equations. Max 150 KB)* | |
| **I have scrutinized the question paper. There is no spelling mistake or any type of irrelevant question.** | |



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