BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: ……………………………………………. Roll No.: ………………………………………..

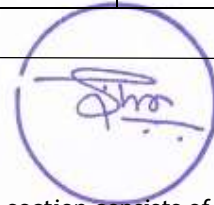Branch: ……………………………………………. Signature of Invigilator: ……………………

Semester: IVth   Date: 04/05/2022 (MORNING)

Subject with Code: **EE361 LINEAR CONTROL THEORY**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.

2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**

3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.

4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.

5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.

6. Write on both side of the leaf and use pens with same ink.

7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.

8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.

9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.

10. Always maintain the highest level of integrity. Remember you are a BITian.

11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS:Btec

BRANCH:CS

SEMESTER : IV
SESSION : sp/22

SUBJECT: EE361 Linear Control Theory

TIME:2 hr.

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 2part section A and section B
2. Section A is MCQ @1 marks of 30 marks.
3. Section B is of 6 question @5 marks ,from witch 4 question of 20 marks you have to attend
4. The missing data, if any, may be assumed suitably.
5. Before attempting the question paper, be sure that you have got the correct question paper.
6. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Section A

1. What is Control System?
a) Control system is a system in which the output is controlled by varying the input
b) Control system is a device that will not manage or regulate the behaviour of other devices using control loops
c) Control system is a feedback system that can be both positive and negative
d) Control System is a system in which the input is controlled by varying the output

2 Which of the following element is not used in an automatic control system?
a) Final control element
b) Sensor
c) Oscillator
d) Error detector

3. What is the characteristic of a good control system?
a) Insensitive to the parameter variation but sensitive to the input commands
b) Neither sensitive to parameter variations nor sensitive to input commands
c) Insensitive to the input command
d) Sensitive to parameter variation

4. Which of the following element is not used in an automatic control system?
a) Final control element
b) Sensor
c) Oscillator
d) Error detector

5. Which of the following statement is true about Feedback control system?
a) Equally sensitive to forward feedback path parameter changes
b) Insensitive to both forward and feedback path parameter changes
c) Less sensitive to feedback path parameter changes than to forward path parameter changes
d) Less sensitive to forward path parameter changes than to feedback path parameter changes

6. In a control system the output of the controller is given to
a) Amplifier
b) Sensor
c) Final control element
d) Comparator

7. In pneumatic control systems the control valve used as the final control element converts

a) Position change to pressure signal
b) Electric signal to pressure signal
c) Pressure signal to electric signal
d) Pressure signal to position change
8. In closed loop control system, what is the sensitivity of the gain of the overall system, M to the variation in G?
a) G/1GH
b) 1/1+GH
c) G/1+G
d) 1/1+G
9. Which of the following is an example of an open loop system?
a) Household Refrigerator
b) Respiratory system of an animal
c) Stabilization of air pressure entering into the mask
d) Execution of program by computer
10. The overall transfer function from block diagram reduction for cascaded blocks is :
a) Sum of individual gain
b) Product of individual gain
c) Difference of individual gain
d) Division of individual gain
11. The overall transfer function of two blocks in parallel are :
a) Sum of individual gain
b) Product of individual gain
c) Difference of individual gain
d) Division of individual gain
12. Transfer function of the system is defined as the ratio of Laplace output to Laplace input considering initial conditions_____
a) 1
b) 2
c) 0
d) infinite
13. Oscillations in output response is due to :
a) Positive feedback
b) Negative feedback
c) No feedback
d) None of the mentioned
14. The mechanism of control of body temperature is non feedback system?
a) True
b) False
15. Feedback always increases the gain?
a) True
b) False
16. The effect of adding feedback makes the system_____
a) Linear
b) Non-linear
c) Time variant
d) Time invariant
17. Heavy lifting work is often accomplished by shifting fluids in big machines. The power system of such machines can be described as
a) Reciprocating
b) Pneumatic
c) Hydraulic
d) Hybrid
18. The scientific principle that makes hydraulic systems possible is
a) Pascal's principle

b) Boyle's law
c) Bernoulli's principle
d) The fluid flow principle
19. Pneumatic systems usually do not exceed:
a) 1 hp
b) 1 to 2 hp
c) 2 to 3 hp
d) 4 to 5 hp
20. Transient response analysis is done for_____ systems.
a) Unstable
b) Stable
c) Conditionally stable
d) Marginally stable
21. First order system is defined as :
a) Number of poles at origin
b) Order of the differential equation
c) Total number of poles of equation
d) Total number of poles and order of equation
22. Laplace transform of unit impulse signal is :
a) A/s
b) A
c) 1
d) 1/s
23. The damping ratio and peak overshoot are measures of:
a) Relative stability
b) Speed of response
c) Steady state error
d) Absolute stability
24. What will be the nature of time response if the roots of the characteristic equation
are located on the s-plane imaginary axis?
a) Oscillations
b) Damped oscillations
c) No oscillations
d) Under damped oscilaations
25. Steady state refers to
a) Error at the steady state
b) Error at the transient state
c) Error at both state
d) Precision
26. Zeroes are defined as:
a) Roots of the denominator of the closed loop transfer function
b) Roots of the numerator of the closed loop transfer function
c) Parts of the numerator
d) Parts of the denominator
27. Which among the following is a unique model of a system?
a) Transfer function
b) State variable
c) Block diagram
d) Signal flow graphs
28. State space analysis is applicable even if the initial conditions are _____
a) Zero
b) Non-zero
c) Equal
d) Not equal

29. Conventional control theory is applicable to _____ systems
a) SISO
b) MIMO
c) Time varying
d) Non-linear
30. If the roots of the have negative real parts then the response is _____
a) Stable
b) Unstable
c) Marginally stable
d) Bounded

Section B

Q1 Consider a system with transfer function $G(s) = s+6/Ks^2+s+6$. what will be the value of k when Its damping ratio will be 0.5.

Q2 Find the Laplace transform of the signal $x(t) = e^t \sin 2t$ for $t \leq 0$.

Q3 Derive the transfer function of the following mechanical systems and draw the corresponding block diagram
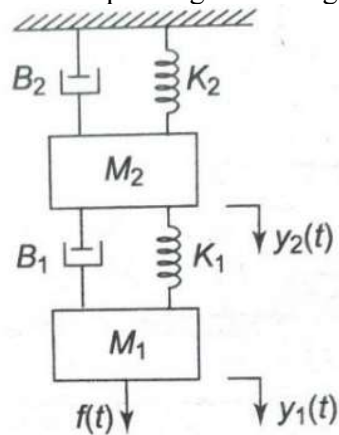
Q4 The characteristic equation of a system is given as $s^3+25s^2+10s+50=0$. Find the stability using R-H criterion.

Q5 The open loop transfer function of the feedback control system is given by $G(s) = K(s+3)/s(s+4)^2(s+5)(s+6)$. Find the number of asymptotes and the centroid of asymptotes of the root loci of closed loop system.

Q 6 The open loop transfer function of a unity feedback system has only two poles located at origin. The break-in point of the root locus is at $s = -10$. Discuss the nature of the root locus and find the open loop transfer function.