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

CLASS: B.TECH SEMESTER: VII
BRANCH: EEE SESSION: MO/2022

SUBJECT: EE439 APPLIED CONTROL THEORY

TIME: 2 HOURS FULL MARKS: 25

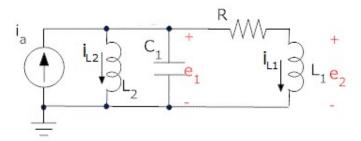
INSTRUCTIONS:

- 1. The total marks of the questions are 25.
- 2. Candidates attempt for all 25 marks.
- 3. Before attempting the question paper, be sure that you have got the correct question paper.
- 4. The missing data, if any, may be assumed suitably.
- 5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- Q1 (a) Define state variable. What is the general representation of a LTI system in state space [2] form.
- Q1 (b) Construct the state model for a system characteristic by the differential equation [3] $D^3y/dt^3 + 4 d^2y/dt^2 + 3 dy/dt + 2y = u$. Give the block diagram representation of state model.
- Q2 For the transfer function $G(s) = \frac{10(s+2)}{(s+1)(s+3.5)}$ Obtain
- (a) Controllable Canonical Form [2]
- Q2 (b) Observable Canonical Form [3]
- Q3 (a) Obtain the transfer function of the system given below and hence comment on the [2] order of the system $x = \begin{bmatrix} -1 & 0 \\ 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 0 \end{bmatrix} u$; $y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$
- Q3 (b) Investigate the following system for controllability and observability [3]

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$
$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

- Q4 Obtain the state space representation of an armature-controlled DC motor. [5]
- Q5 Find the state space model of the given electrical system [5]



::::: 28/09/2022 :::::M