



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SECOND YEAR SECOND TERM EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

CONTROL SYSTEMS

DATE: 11/6/2021

TIME: 8.30-11.30 AM

INSTRUCTIONS

Attempt all questions

- 1 a) State and explain TWO reason for system modelling (10 marks)
b) Briefly explain the three element of closed loop control system
 - i. Error detector
 - ii. The controller
 - iii. Output element
- 2 a) Define the following terms (10 marks)
 - i. System stability
 - ii. Routh stability criteriab) Considering a 4th order system with characteristic equation below determine if the system is stable or unstable (14 marks)
$$S^4 + 8S^3 + 18S^2 + 16S + 5 = 0$$
3. a) Form a Routhie table for a system with the given characteristic equation (16 marks)
$$S^6 + S^5 - 2S^4 - 3S^3 - 7S^2 - 4S - 4 = 0$$
 and determine whether the system is stable or not
b) Define the term transfer function (4 marks)
- 4 a) Define the following TERM as used in plotting bode plots (8 marks)
 - i. Gain margin
 - ii. Phase margin
 - iii. Corner frequency

- b) State and explain four advantage of bode plot in determining the stability of a system (12 marks)
- 5 a) Explain briefly the FOUR steps of drawing a bode plots (5 marks)
- b) For the system given below identify whether the system is stable or unstable (15 marks)
- $$10/S(S+1) (S+5)$$