

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
THIRD SEMESTER M.TECH DEGREE EXAMINATION
ELECTRONICS & COMMUNICATION ENGINEERING
(ROBOTICS & AUTOMATION SYSTEMS)
04EC 7903 MECHATRONICS SYSTEM DESIGN**

Time: 3 hrs

Max. Marks: 60

PART A

(Answer all questions. Each question carry 3 marks).

1. How an optical encoder be used as a position sensor? Explain its working with necessary figure. (3)
2. What is "Fringe Condition Modules"? What is its role in Industrial Machine control? Give examples of any three fringe conditions. (3)
3. What is pneumatic capacitance? Derive its expression. (3)
4. Explain the working of PORT1 with suitable diagram. (3)
5. How is accuracy of output affected by resolution of ADC? Give necessary example to support the answer. (3)
6. Explain the working of a stepper motor. (3)
7. What is thresholding? Explain its application in image processing. (3)
8. Explain the input and output considered in an Automobile engine management system? (3)

PART B

(Each full question carries 6 marks).

9. Differentiate sensors and actuators. Classify various types of actuator systems with suitable examples. (6)

OR

10. Explain the working of vibration and acoustic emission sensor with necessary diagram. (6)
11. What is PLC? How can it be programmed using Ladder logic? List out the given functions (6) using Ladder logic. (a) Normally closed (b) Normally open (c) AND (d) OR (e) latching circuit (f) timer

OR

12. Design a control circuit using cascade method for given displacement-step diagram. (6)

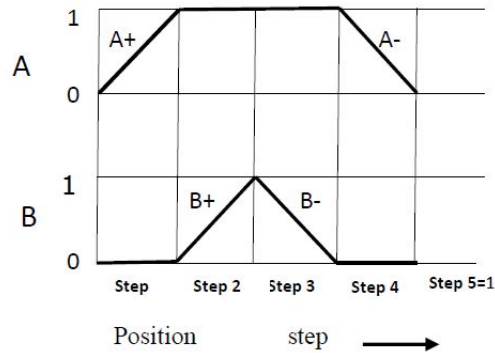


Figure 1: Displacement-step diagram

13. Draw the mathematical model of a wheel of car moving along a road, using spring, mass and damper. Derive the differential equation describing the relation between input force and output displacement. (6)

OR

14. Derive the expressions for three basic building blocks of hydraulic system. (6)
15. Write a program to control stepper motor of 200 teeth to advance an angle of 180 degrees using 8051. Generate delay of 10ms between consecutive steps using timer0. (6)

OR

16. Explain the architecture of 8085 with suitable block diagram. (6)
17. What is a virtual Instrument? What are its components? What are limitations of a virtual instruments compared to real ones? Give example. (6)

OR

18. Identify any 5 components that can be included under the Mechanical system in a Mechatronic system? List out three unique features of each of the above listed component. (6)
19. Analyse the system of a Automatic Bottle filling unit. Draw its interfacing diagram. (6)

OR

20. Explain the image capturing in a digital camera, with necessary diagram. (6)