

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

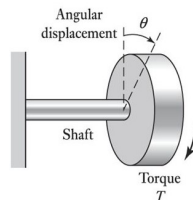
Time: 3 hrs

Max. Marks: 60

**PART A**

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

1. Compare the working principles of thermostat and thermistor. (3)
2. Simplify the Boolean equation  $Q = \bar{A}.\bar{B}.C + \bar{A}.\bar{B}.\bar{C} + \bar{A}.B.\bar{C}$  using Karnaugh map. (3)
3. Devise a model and obtain differential equation for system given below. (3)



4. Explain the addressing modes of 8085 with suitable examples. (3)
5. What is Nyquist frequency? How is it vital in Analog to Digital conversion? (3)
6. Explain the working of a stepper motor. (3)
7. What is Histogram in image processing? How is it represented? What all details can be analysed from a histogram? (3)
8. Explain the working of a Charge coupled device? (3)

**PART B**

*(Each full question carries 6 marks).*

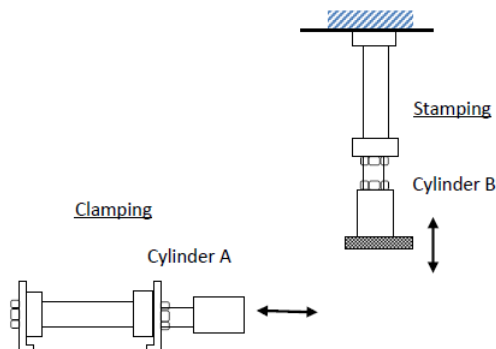
9. Differentiate sensors and actuators. Classify various types of actuator systems with suitable examples. (6)

OR

10. Differentiate between simple and compound Gear train. Explain the Gear ratio with the help of a simple gear train. (6)
11. What is PLC? How can it be programmed using Ladder logic? List out the given functions using Ladder logic. (a) Normally closed (b) Normally open (c ) AND (d) OR (e ) latching circuit (f) timer (6)

OR

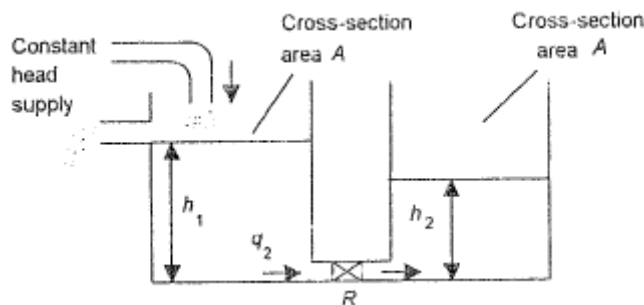
12. In a press shop, stamping operation to be performed using a stamping machine. Before stamping, workpiece has to be clamped under stamping station. Then stamping tool comes and performs stamping operation. Work piece must be unclamped only after stamping operation. Positional layout figure is given. Design a pneumatic circuit using cascade method. (6)



13. Derive the expression for transfer function of a second order system denoted by  $a_2 \frac{d^2x}{dt^2} + a_1 \frac{dx}{dt} + a_0x = b_0y$ . Find its characteristic equation and poles. (6)

OR

14. Derive relationship between the height  $h_2$  and time for hydraulic system shown below. (6)



15. Explain the architecture of 8085 with suitable block diagram. (6)

OR

16. Explain working of timer1 of 8051, in 13 bit mode, to generate a delay of 50 microseconds. Assume that the crystal oscillator frequency fed to system is 12MHz. (6)
17. Explain the architecture of a Data Acquisition System. What are the main functions performed in the system? (6)

OR

18. Explain the components of an Analog to Digital conversion system. How these components work in Successive Approximation type ADC? (6)
19. Explain the working of a Vidicon camera, with necessary diagram. (6)

OR

20. What is Connectivity in image processing? Detail any 3 types of connectivity. (6)