Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018
Course Code: ME407
Course Name: MECHATRONICS

Max. Marks: 100   Duration: 3 Hours

PART A
Answer any three full questions, each carries 10 marks.

                                                            Marks

1   a)   Explain the working principle of thermocouples.   (2)

     b)   What is a thermos pile? What is the principle used to increase the sensitivity of   (4)
thermopile?

     c)   Explain the working of any one non-contact temperature measurement system.   (4)

2   a)   Illustrate the working of a strain gauged load cell.   (8)

     b)   List four examples of temperature sensors.   (2)

3   a)   Explain any two situations when pneumatic actuators are preferred over   (2)
hydraulic ones.

     b)   Explain the configuration of a pneumatic actuation system with a block diagram   (4)

     c)   Explain the schematic of a 5/2 way pilot operated valve.   (4)

4   a)   Distinguish between pilot operated and direct operated DCVs   (2)

     b)   Design a pneumatic circuit to operate a clamping cylinder using a pilot operated   (8)
5/2way valve and two push button operated 3/2way valves.

PART B
Answer any three full questions, each carries 10 marks.

5   a)   Explain the sputtering process with a neat sketch.   (6)

     b)   Differentiate between electroplating and electro-less plating associated with   (4)
chemical deposition methods.

6   Illustrate the working of capacitance based accelerometer.   (10)

7   a)   Explain the working of recirculating ball screws with a neat sketch   (6)

     b)   Explain the two preloading techniques for ball screws with diagrams   (4)

8   a)   Draw the ladder diagram for the following logic functions.   (4)

         (i)   XOR

         (ii)   NAND

         (iii)   NOR

         (iv)   AND

b) Illustrate the significance of Internal Relays in PLC program. (2)

c) Explain 'latching' in PLC logic with an example. (4)

PART C
Answer any four full questions, each carries 10 marks.

9 a) Illustrate the working of Harmonic Drives with neat sketches (8)

    b) What are the advantages of harmonic drive over gear drives (2)

10 a) Bring out the working principles of Triangulation method and elapsed time method used in range finders. (6)

    b) Explain different methods adopted in light based range finders. (4)

11 a) Sketch and explain working of an AC servomotor. (5)

    b) Using neat diagram, explain working of a tactile sensor. (3)

    c) List any *two* requirements of an ideal range finder. (2)

12 a) Using sketches and block diagrams, discuss the working of mechatronics system-based automobile engine management system. (6)

    b) List any *two* image data reduction techniques for image processing and analysis. (2)

    c) With a schematic diagram, discuss how a template match technique is implemented in image processing. (2)

13 a) Define the terms 'gray image' and 'threshold' in connection with Digital images. Explain the role of histogram in achieving a binary image. (7)

    b) Bring out any 3 difference between CCD and CID camera. (3)

14 Design PLC based automated car parking barrier system with suitable sensors and actuators. Design the ladder logic for PLC so that the system collects coins for parking cars and the barrier prevents the entry of more than one vehicle for a single coin collection and also prevents entry of cars when a max number has reached. (10)

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