Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B.E.
Year : IV
Course : MEPP 427
Semester : I
Exam Roll No. :
Time: 30 mins.
F. M. : 20
Registration No. :
Date JUL 14 2017

SECTION "A"
[10 Q × 1 =10 marks]

Encircle the most appropriate option.

1. Functional requirement identification in system engineering is done in .....
a) process input b) synthesis c) requirement analysis d) process output

2. ..... has both active and passive sensor.
a) Camera b) Opto-Sensor c) SONAR d) RADAR

3. For a continuously adjustable swept volume, ...motors are used.
a) gear and vane b) georotor c) axial piston d) gear

4. .....sensor are reliable, high speed, long life, sensors and are directly compatible with other electronic circuits
a) Opto b) Magnetic c) Thermo d) Microwave

5. Simplifying Boolean expression $A.(B+C)+A(C+B')$ gives.....
a) A b) B c) AB+AC d) AC

6. .....motors are commonly used as starter motor.
a) PMDC b) Three Phase c) Shunt d) Series

7. Cine film advance mechanism utilizes .....mechanism
a) Double-lever b) Double-crank c) Lever-crank d) Slider-crank

8. Linear velocity of Rack and Pinion of 50 Hz frequency that moved at 2 m distance parallel to the screw axis is ....m/s
a) 2.5 b) 25 c) 100 d) 1000

9. .....can handle large current in less time
a) Relay b) Solenoids c) Solid state switch d) Stepper motor

10. .....motor is used in high torque machines like air compressors, high-pressure water pumps, vacuum pumps,
a) Induction b) Synchronous c) Three Phase d) Single Phase

SECTION "B"
[5 Q × 1 =5 marks]

Write 'T' for TRUE statements and 'F' for FALSE statement.

11. In Playback robot, a human operator performs the task manually. [ ]

12. Actuator is a device that generates a signal or stimulus. [ ]

13. Cobalt is not Ferrous Material. [ ]

14. In pull-type gravity-return-type single-acting hydraulic cylinder, the cylinder lifts the weight by retracting. [ ]

15. If the distance between shafts is large, a belt drive is more suitable than gears for power transmission. [ ]

SECTION "C"

[5 Q × 1 =5 marks]

Fill in the blanks with most suitable answer.

16. Converting the decimal number 53 to radix 6 gives .....

17. Three elements to create artificial intelligent system are testing, training and .....

18. ..... represents the same value under identical conditions when measured at different times.

19. The synchronous speed of motor that we use in Nepal with 12 no poles has .....

20. X.Y+Y.Z+X' Z≡X.Y+X'Z is known as ..... Theorem.

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SECTION "D"

Attempt *ANY FIVE* questions and Q. N. 1 is compulsory.

1. a. Define Mechatronics with Venn diagram. List out the characteristics of typical mechatronic system and integrated design. [3+2]
   b. Differentiate [1×2=2]
      i. Displacement and proximity sensor.
      ii. Error and Accuracy
   c. List out and describe briefly on features of sensors and transducers. [4]

2. a. Find the output voltage of the inverting amplifier with resistance R_s=5 Ohm, R_f =10 Ohm and input voltage 5 volt. [1]
   b. What is signal linearization and how it can be achieved? ADC is used to convert the transducer's 800mV to 1500mV analog value to binary values ranging from 01010000 (80) to 10010110 (150), find each unit of the digital output. [2+1]
   c. What is Hall Effect? How and in what kind of sensor it is utilized? [1+2]
   d. Find an output voltage with circuit diagram for differentiator and integrator amplifiers. [2+2]

3. a. What is fluid power system? List types of Hydraulic actuation system and discuss on different types of rotary actuators types [1+4]
   b. List out the components of Pneumatic system and draw its symbolic representation diagram. [3]
   c. Discuss on use and type of different kinds of bearings. [3]

4. a. How electrical actuation system works? Draw a schematic diagram of controlled drive system. [1+2]
   b. Differentiate *ANY THREE* [3×2=6]
      i. AC and DC motor
      ii. Shunt and Series wound motor
      iii. Synchronous and asynchronous motors
      iv. Solid-state switches and solenoids
   c. Find the actual speed of a motor with synchronous speed 1200 rpm? [2]

5. a. Explain how Mechatronics could be used for industrial automation in Nepal, illustrate with suitable example. [6]
   b. Explain about Mini project that you would like to carry out as part of mechatronic demonstration. [5]

6. a. Discuss on Anatomy of Robot and manipulator representation with diagram. [1+3]
   b. Classify robot based upon function and Cartesian coordinate system. Describe any two. [4]
   c. Write methodology on your mini project and design a circuit of the project with description. [3]