Roll No:

B.TECH
(SEM VII) THEORY EXAMINATION 2021-22
AUTOMATION & ROBOTICS

Time: 3 Hours   *Total Marks: 100*

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. **Attempt** *all* **questions in brief.**   **2 x 10 = 20**
   a. What is flexible Automation?
   b. What do you understand by fluid power?
   c. Write down the function of placement device.
   d. Explain robot arm dynamics.
   e. Write down the advantages of programmable part feeder.
   f. Define robotics.
   g. Describe silent chain.
   h. Write some main advantages of gear drive.
   i. Describe robot oriented programming.
   j. What is the use of palletizing robot?

SECTION B

2. **Attempt any** *three* **of the following:**   **10 x 3 = 30**
   a. Discuss the advantages & limitations of pneumatic power systems as compared to hydraulic systems. What is feedback control system?
   b. What is cycle time analysis? Describe its benefits? Describe drum type transfer machines.
   c. Explain the working of suction grippers. Compare its advantage & limitations with magnetic grippers.
   d. Discuss in detail about types of flat belt drives with the help of sketches.
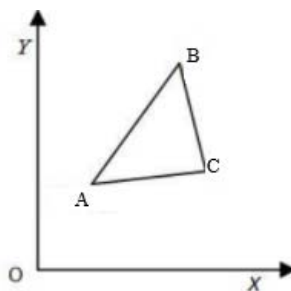   e. Define robot work cell? What are its different types? Describe any two with sketches.

SECTION C

3. **Attempt any** *one* **part of the following:**   **10 x 1 = 10**
   (a) What are the principles of automation? Discuss about the role of robotics in industrial automation? Discuss in detail.
   (b) Describe the components of hydraulic power system with neat sketch.

4. **Attempt any** *one* **part of the following:**   **10 x 1 = 10**
   (a) Discuss about basic elements of the parts delivery system in detail.
   (b) What are the different types of production line? Discuss each in detail.

5. **Attempt any** *one* **part of the following:**   **10 x 1 = 10**
   (a) How robots are categorized on the basis of geometric work envelope. Discuss each category in brief.

   (b) The figure below represents a triangle ABC with initial coordinates of the vertices as A(2,3),B(4,5) and C(5,3.5). The triangle is rotated in the X-Y plane about the vertex A by angle θ in clockwise direction. Take $\sin \theta = 0.6$ and $\cos \theta = 0.8$. Find out the new coordinates of the vertex B using transformation matrix method.

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6. **Attempt any *one* part of the following:** 10 x 1 = 10
  (a) What are electric actuators? What are their main advantages & disadvantages? Also discuss about their types?
  (b) Explain the working of magnetic grippers. Also mention its advantages & limitations. Also compare angular grippers with parallel grippers.

7. **Attempt any *one* part of the following:** 10 x 1 = 10
  (a) What is robot simulation? Write down the advantages & disadvantages of robot simulators. Also, discuss the use of robots in inspection work.
  (b) Discuss in detail about major safety considerations in using robots in painting & welding processes. Also, write the differences between online & offline programming for industrial robots.