Reg.No.

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEM. M. Tech. (MANUFACTURING ENGINEERING)
END SEMESTER EXAMINATIONS

APRIL 2019

SUBJECT: **PRODUCTION AUTOMATION [MME- 5222]**
REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer all the questions.
- Missing data may be suitable assumed.

1A. Explain the salient features of following types of production with sketch. **(02)**
i) Fixed Position Layout ii) Flow line Layout

1B. Explain the working of an absolute rotary encoder which is used as a feedback device in CNC system. **(02)**

1C. Discuss the following advanced automation functions. **(02)**
i)Maintenance and Repair Diagnostics
ii)Error Recovery

1D. Sketch and explain the principle of working of different tool monitoring systems used in CNC machines. **(04)**

2A. Explain the working Recirculating Ball Screw with sketch and state its advantages over the conventional lead screws. **(03)**

2B. Write the nomenclature of Tungsten carbide Tool Holder used in Turning center. **(03)**

2C. Discuss the different types of loads coming on the CNC machine structure and how they are taken care while designing the machine. **(04)**

3A. Sketch the arrangement and write the allowable error while conducting the following acceptance tests on a CNC Turning Centre. **(03)**
i) Parallelism of Table surface with respect to X axis
ii) Squareness of Spindle axis to Table surface in XZ plane

3B. Explain the following features of Computer Numerical Control system. **(03)**
i) Work offset in CNC Machining center
i) Tool Nose Radius in Turning Center
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3C. Sketch the following with reference to the CNC machines. **(04)**

i) Power-Torque-Speed characteristic curves of AC spindle motor
ii) Angular contact ball bearing used in spindle
iii) Linear Roller Bearing used in guide ways
iv) Timer Belt and Pulley

4A. Formulate the position matrix for cylindrical robot with motion in the following sequence **(04)**

a) Translation along x axis by r units
b) Rotation about Z axis by angle Θ
c) Translation along Z axis by l units

4B. Write a note on controlled path robot in detail **(04)**

4C. Sketch and explain the basic robotic motions **(02)**

5A. List atleast 6 design consideration for gripper design as per J.F. Engelberger guidelines **(03)**

5B. A Robot must pick up the components from incoming conveyor system and place on different locations of the pallet as shown in the figure Q 5(B).The spacing between dropping location is 20 cm in both x and y directions. Using the appropriate commands write the complete compact robot program to achieve this task efficiently using *loop commands only*. Assume suitable variable locations. **(04)**

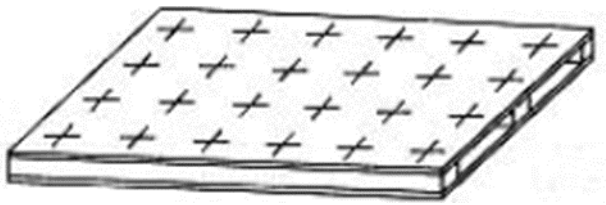

Figure Q 5(B) Pallet for placing components

5C. What is error detection and recovery in work cell controller? List any four error recovery strategies **(03)**