# **Question Paper**

Exam Date & Time: 02-May-2019 (02:00 PM - 05:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

#### INTERNATIONAL CENTER FOR APPLIED SCIENCES IV SEMESTER B.Sc. (Applied Sciences) in ENGG. END SEMESTER THEORY EXAMINATION APRIL/MAY 2019

**AUTOMATED MANUFACTURING SYSTEMS [IMET 243]** 

Marks: 100

#### Answer 5 out of 8 questions.

### Missing data may be suitable assumed with justification.

- In CNC, center of the tool follows the programmed path. Then how the machining along the edges of billet is possible? Discuss in detail with aid of neat diagram.
  - <sup>B)</sup> Discuss the significance of G98 and G99 in canned cycle. <sup>(6)</sup>
  - C) Elaborate on the scaling function used in CNC programming. (4)
- <sup>2)</sup> Write a program in word address format for the profile shown in FigQ2A.using <sup>(10)</sup> different interpolations. Take 10mm slot diameter and depth of cut 10mm.
  - A)



Fig Q2A: Programming Profile (all dimensions are in mm)

<sup>B)</sup> Briefly discuss about the different types of coding scheme structure and in <sup>(10)</sup> detail explain about the optiz coding.

What are the different types of Adaptive control(AC) systems used in CNC (10) machines? Enumerate the machining situations where adaptive control can be beneficially applied. Configure and explain suitable AC machining system

Duration: 180 mins.

tor cutting a workpiece that has casting detect.

- Apply the PFA method for the following part mix and machines to identify
  logical part families and machine groups to derive the benefit of Group
  Technology. The part mix consists of 06 variants (Part A, Part B, Part C, Part D, Part E, and Part F). Machine 1 performs Milling, Machine 2 performs
  Drilling, Machine 3 Performs Turning, Machine 4 Performs Shaping, Machine
  5 Performs Grinding and whereas Machine 6 performs Honing. Part A is
  manufactured by Milling and Turning operations, Part B is manufactured by
  Turning and Grinding processes, Part C is manufactured by shaping and
  honing processes part D requires Drilling, Shaping, and Honing operations,
  Part E requires Milling and Grinding, whereas Part F is manufactured out of
  Drilling and Honing processes.
- <sup>4)</sup> The warehouse layout of an Ecommerce enterprise is shown in Fig.Q4A. The material <sup>(10)</sup> transport vehicles travel in a shown direction around the loop to deliver loads from the

A) load station to the unload station. Loading time at the load station = 5.5 min, and unloading time at the unload station = 3.2 min. It is desired to determine how many vehicles are required to satisfy demand for this layout if the vehicles must complete a total of 25del/hr. Site 1 is ASRS system used for loading and unloading the components. Site 2, 3 and 4 are for packaging and sorting.

Calculate the total travel distance and empty distance for the sequence of i) 5 times 1-2-1, ii)2 times 1-2-4-1, and iii)1 time 1-2-3-1. The following performance parameters are given: vehicle velocity= 50m/min, availability = 0.92, traffic factor = 0.85, and E = 0.90 also Determine: (a) travel distances loaded and empty, (b) ideal delivery cycle time, and (c) number of vehicles required to satisfy the delivery demand.



Fig. Q4A: Warehouse layout map (All distances are in meters)

- B) What are the different criteria applied for testing the flexibility of manufacturing cell? Discuss in detail any four FMS layouts with neat diagrams.
- <sup>5)</sup> An FMS consists of four stations. Station 1 is a load/unload station with one server. Station <sup>(20)</sup>
  2 performs milling operations with three servers (three identical CNC milling machines).
  Station 3 performs drilling operations with two servers (two identical CNC drill presses).

(10)

Station 4 is an inspection station with one server that performs inspections on a sampling of the parts. The stations are connected by a part handling system that has two work carriers and whose mean transport time = 3.5 min. The FMS produces four parts. A, B, C, and D. The part mix fractions and process routings for the four parts are presented in the table. Determine:

(a) Maximum production rate of the FMS.

(b) Corresponding production rate of each part.

- (c) Utilization of each station in the system.
- (d) The overall FMS utilization.

Part (j)	Part Mix (Pj)	Operation (k)	Descriptio n	Station (i)	Process Time (tijk) min.	Frequency Fijk
A	0.1	1	Load	1	4	1.0
		2	Mill	2	20	1.0
		3	Drill	3	15	1.0
		4	Inspect	4	12	0.5
		5	Unload	1	2	1.0
В	0.2	1	Load	1	4	1.0
		2	Drill	3	16	1.0
		3	Mill	2	25	1.0
		4	Drill	3	14	1.0
		5	Inspect	4	15	0.2
		6	Unload	1	2	1.0
Part (j)	Part Mix (Pj)	Operation (k)	Description	Station (i)	Process Time (tijk) min.	Frequency Fijk
с	0.3	1	Load	1	4	1.0
		2	Drill	3	23	1.0
		3	Inspect	4	8	0.5
		4	Unload	1	2	1.0
D	0.4	1	Load	1	4	1.0
		2	Mill	2	30	1.0
		3	Inspect	4	12	0.333
		4	Unload	1	2	1.0

Table Q5A:	Process	routings	and	part	mix	details
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6)

Xiaomi, one of the leading mobile seller in India has recently launched Air <sup>(8)</sup>
 <sup>A)</sup> laptop. Will the company be able to assemble this laptop at its automated cellphone assembling plant at Andhra Pradesh? Justify your answer with type of automation the company must approach.

- <sup>B)</sup> Describe the basic elements of an automated system with the aid of block <sup>(6)</sup> diagram
- C) Distinguish between the CNC and NC Machines. Enumerate advantages and <sup>(6)</sup> disadvantages of both types.
- <sup>7)</sup> A XYZ company has manufacturing unit which produces different variant of <sup>(10)</sup>

- parts and they do not exhibit too much similarity and new part are introduced on a regular basis. For this kind of manufacturing environment, which CAPP module do you suggest? Explain in detail about the module that you suggest.
- B) Summarize the primary functions of guideways in machine tools. List the (10) different types of guideways and explain the effects of coefficient of friction in friction guideways and methods of keeping it minimum but constant.
- B) Describe how circular interpolation can be achieved. On what parameters (6) interpolation is dependent?
  A)
  - <sup>B)</sup> What are functions of basic elements of NC machine? <sup>(6)</sup>
  - <sup>C)</sup> Compare open loop and closed loop control system in NC machines with the <sup>(8)</sup> help of neat sketches.

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