Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (AUE)/SEM-7/AUE-711/2011-12

2011

ADVANCED MANUFACTURING TECHNOLOGY

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

i) The type of layout suitable for the concept, principles and approaches of 'group technology' is

a) Product layout b) Job-shop layout

c) Fixed position layout d) Cellular layout

e) None of these.

ii) Tool in case of ultrasonic machining is made of

a) HSS b) Diamond

c) Plain Carbon d) Stainless Steel

e) Brass or Copper.

iii) Crater wear occurs mainly due to

a) Abrasion b) Diffusion

c) Oxidation d) Adhesion

e) All of these.

iv) Electrical discharge machining uses the dielectric fluid,

a) Water

b) Aqueous salt solution

c) Sodium hydroxide

d) Kerosene

e) Lard oil.

v) Chromium in H.S.S. cutting tool material is

a) 1% b) 4%

c) 18% d) 0·6%

e) 16%.

vi) Ultrasonic machining method is best used for

a) Brittle materials

b) Stainless steel

c) Plastics

d) Lead

e) Non-ferrous alloys.

vii) Electron beam machining process is suitable for the material having :

a) low melting point and high thermal conductivity

b) low melting point and low thermal conductivity

c) high melting point and high thermal conductivity

d) high melting point and low thermal conductivity

e) all of these.

viii) In electro-chemical machining, best surface finish is obtained

a) with low current density

b) with high current density

c) with slow rate of metal removal

d) with high rate of metal removal

e) at all metal removal rates.

ix) Ceramic tools are made from

a) Tungsten oxide

b) Silicon carbide

c) Cobalt

d) Aluminium oxide

e) Diamond sand.

x) The machining method which uses abrasive slurry is known as

a) Electro discharge machining

b) Laser machining

c) Plasma arc machining

d) Ultrasonic machining

e) Chemical machining.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Write a short note on composite parts.

3. Define the term 'rapid prototyping (RP)'. Explain with neat sketch stereo lithography RP technique. 4 + 1

4. Explain with neat sketch, the working principle of plasma arc machining.

5. Explain the basic components of coordinate measuring machine (CMM).

6. With neat sketches discuss the working principle of main components of an ultrasonic machining.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Write DDA algorithm for linear interpolation for graphics terminals.

   b) Write the equation of a cubic spline using Bernestein polynomial as basis function.

   A cubic Bezier curve is defined by the control points (0, 0), (4, 3), (8, 4) and (12, 12). Find the equation of the curve.

   c) What are the basic types of geometrical transformation that can be applied to an object in Cartesian coordiate ? Derive an expression of transformation matrix for geometric rotation and translation in $x - y$ plane.

   5 + (1 + 4) + 5

8. a) Apply the rank order clustering technique to the part machine incidence matrix in the following table to identify logical part families and machine groups. Parts are identified by letters and machines are identified numerically.

	Parts								
Machines	***A***	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***
1	1			1				1	
2					1				1
3			1		1				1
4		1				1			
5	1							1	
6			1						1
7		1				1	1		

b) Describe with necessary figures, the most common GT cell configurations.

c) What are the benefits of Computer Aided Process Planning (CAPP) over Conventional Process Planning ?

7 + 5 + 3

9. a) What is the communication network structures used in CIM database ? Explain the basic structures in detail.

b) Explain the different components of Flexible Manufacturing System (FMS).

c) Classify FMS according to the level of flexibility and number of machines. (1 + 4) + 5 + 5

10. a) Prove that, for maximum power delivery in Resistance-Capacitance Relaxation Circuit of electrical discharge machining (EDM), discharge voltage should be 72% of supply voltage.

b) What are the functions of electrolyte in EDM ?

c) The composition of a Nimonic alloy turbine blade is 18% Cobalt, 62% Nickel and 20% Chromium. It is being machined electrochemically with current of 1500 amp. Calculate the volumetric material removal rate (in cm^3 /min). The dissolution valency of Chromium is 6 whereas that for both Nickel and Cobalt is 2. Density and atomic weight for Cobalt, Chromium and Nickel are 8·85 g/cm^3, 7·19 g/cm^3, 8·90 g/cm^3 and 58·93, 51·99 and 58·71 respectively. 6 + 2 + 7

11. a) Discuss the principal theories of metal removal in electrical discharge machining.

b) Discuss the process parameters of abrasive jet machining with suitable figure.

c) Explain the operation principle of water jet cutting with a schematic diagram of the unit. 5 + 5 + 5