MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

ME-702

ADVANCED MANUFACTURING TECHNOLOGY

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) Which of the following materials cannot be machined by EDM?

(A) Steel (B) Titanium
(C) WC (D) Glass

(ii) Rapid prototyping by stereolethography is

(A) deformation process
(B) joining process
(C) adding process
(D) removal process

CS/B.Tech/ME/Odd/Sem-7th/ME-702/2015-16

(iii) Selective laser sintering(SLS) is a

(A) traditional manufacturing process
(B) non-traditional manufacturing process
(C) regenerative manufacturing process
(D) ultra-precision manufacturing process

(iv) Material removal is accomplished according to Faraday's Law of Electrolysis in

(A) EDM (B) ECM
(C) LBM (D) EBM

(v) The type of the transducer used in USM is

(A) electro-strictive
(B) magneto-strictive
(C) piezoelectric
(D) inductive

(vi) A 1 cm square through hole can be made in a 2 mm thick glass plate by

(A) AJM (B) USM
(C) ECM (D) EDM

(vii) PAM can be used for machining

(A) electrically conductive material
(B) electrically non conducting material
(C) both (A) and (B)
(D) none of these

(viii) Generally Electron Beam GUN is operated at

(A) atmospheric pressure
(B) at 1.2 bar pressure above atmosphere
(C) at 10 – 100 m Torr pressure
(D) at 0.01 – 0.001 m Torr pressure

(ix) G97S500 indicates spindle speed

(A) 500 ft/min (B) 500 rpm
(C) 500 m/min (D) 500 m/sec

(x) During the execution of a CNC part program bock N 020 G02 X45.0 Y25.0 R 5.0 type of tool motion will be

(A) circular interpolation –clock wise
(B) circular interpolation –ccw
(C) linear interpolation
(D) rapid feed

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Classify the manufacturing industries on the basis of the type of production, plan layout and automation. 5

3. How is close loop control different from open loop control? Explain in reference to numerical control of tool-work motions in machine tool. 5

4. A component made of iron is to be machined by ECM process, the valency of iron is 2. The density of iron is 7.8 gm/cm^2. The atomic weight if iron is 56 gm. Faraday's constant is 1609 amp.min. Calculate of current consumption if material removal is 3 cm^3/min.

5. What does "Cutter radius compensation" and "tool nose radius compensation" mean in regarding to milling and turning respectively? Mention two major attributes of CNC machining centre.

6. What is the difference between manual part programming and computer-assisted part programming.

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 4

7. (a) A hole 2 cm in diameter and 10 cm deep is to be made in a product made of tungsten by ECM with following data

Current density = 200 amp/cm^2
Atomic weight of tungsten = 186 gm
Density of tungsten = 19.4 gm/cm^3
Valence at which dissolution takes place = 2
Take value of F = 96500 coulomb
Calculate metal removal rate and time to make the hole.

b) Write a program using 'G code and M code' for turning and facing of the shift as shown in Fig-1

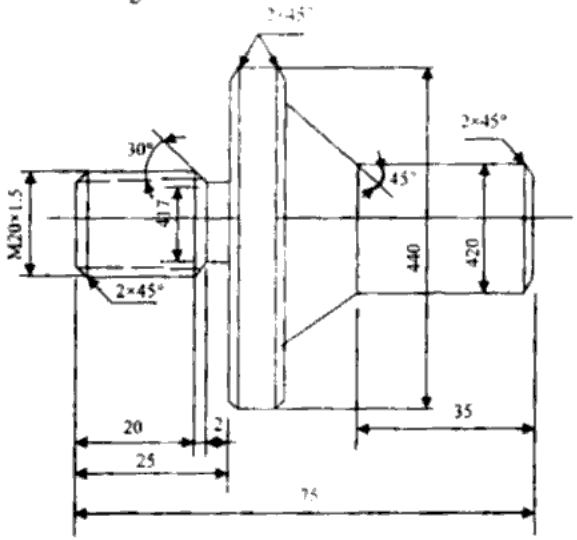

Figure 1
(All dimensions are in mm and not to the scale)

8. (a) What are the advantages of Laser Beam Machining? 5

(b) State the advantages of flexible automation over hard (or fixed) automation. 5

(c) Discuss the mechanism of material removal for Abrasive Jet Machining. How to select the best possible abrasive and nozzle material to be used in this process? 5

9. (a) Draw a schematic Diagram of Ultrasonic Machining (USM) set up and describes the working principle of USM 7

(b) Discuss the Influence of Process parameters of USM on 3
(i) Machining rate (ii) Surface finish and (iii) Accuracy.

(c) Explain application, advantages and limitations of Wire-cut EDM. 5

10.(a) Why does the number of workstations in a system have an impact upon the type of manufacturing system that is finally implemented and why is workstation layout an important consideration in the manufacturing system? 5

(b) What is concurrent engineering? How does it differ from sequential engineering? 5

(c) Prove that in a steady state or equilibrium condition with a constant feed, the gap between tool and work piece in ECM process remains constant. 5

11.(a) Figure 2 shows the final profile to be generated on a MS bar stock of diameter 90 mm and 150 mm length by using a CNC turning center. Write CNC part program and show the tool path. 15

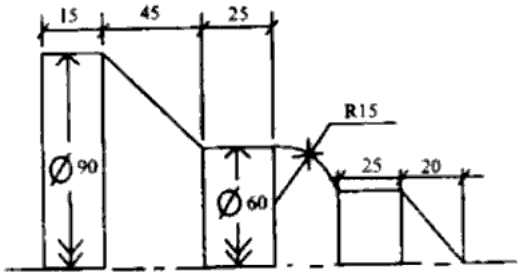

Figure 2: A component to be turned.
(All dimensions are in millimeters. Figure not to the scale)

(b) How are 'lines' and circles' expressed by the Geometry statements for a part programming in APT language for machining jobs in CNC milling machines?