THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

DIPLOMA IN TECHNOLOGY – LEVEL 03

FINAL EXAMINATION – 2005/2006

MEX3233/MED1205 – WORKSHOP TECHNOLOGY – PAPER II

DATE   :   APRIL 05, 2006

TIME   :   1015 HRS – 1230 HRS.

DURATION :   2 ¼ HOURS

PART B

Answer five questions only. All questions carry equal marks.

Question 1

i)   What are the major parameters, which decide the suitability of a lathe for a particular job? Show them systematically on a drawing of a lathe in its three main views (Front elevation, End elevation and Plan)

ii)   Illustrate any three devices employed to hold and drive work pieces on a centre lathe.

iii)   A square shaped steel plate of 300 mm in size having thickness of 10 mm is to be bored with a hole to the size of 100 mm in diameter with its center at the center point of the plate. Explain with neatly drawn sketches, how this operation could be carried out on a centre lathe.

Question 2

i)   Cast Iron, steel and wrought iron are major ferrous materials obtained from iron ore. Name and briefly explain the processes used to convert iron ore into the three types of metals.

ii)   Why are alloying elements added to steel?
Name frequently used alloying elements. Explain the effect of each alloying element and its effects on the properties of steel.

iii)   With the aid of s sketch, explain the electric arc furnace used for steel making.

Question 3

i)   Sketch a simplified form of iron–carbon equilibrium diagramme that is of importance in the study of heat-treatment of steel. (Consider the temperature range from 200^0 C – 900^0 C and composition of carbon from 0 – 1.2%)

ii)   In the equilibrium diagramme mark the regions where the following solid solutions can exist.

Pearlite and Cementite   Pearlite and Austenite

Austenite   Ferrite and Austenite

Cementite and Austenite

iii)   Use the iron-carbon equilibrium diagramme and explain how it is used for annealing a piece of steel with 0.6% carbon, stating the heating and cooling process with the associated temperatures.

Question 4

i)   Classify the drilling machines based on their structural design.

ii)   A hole with 10 mm in diameter is required to be drilled on an aluminum plate. State the step-by-step procedure to be followed. Use the following information to calculate the spindle speed of the drilling machine.

Material Being drilled	Cutting speed in mm/min
Aluminium	70 – 100
Brass	35 -50
Mild steel	30 - 40
Cast iron (grey)	25 - 40

If the plate thickness is 12 mm, calculate the time taken for the drilling operation.

Use following feed rates against the drill diameters

Drill diameter in mm	Rate of feed in mm/rev
1.0 – 2.5	0.040 – 0.060
2.6 – 4.5	0.050 – 0.100
4.6 – 6.0	0.075 – 0.150
6.1 – 9.0	0.100 - 0.200
9.1 – 12.0	0.150 – 0.250

Question 5

i)   With suitable sketches explain the following machining operations.

a)   Counter sinking

b)   Counter boring

c)   Spot facing

Name and sketch the cutter to be used in each operation.

ii) What are the important angles of a single–point cutting tool? Use sketches to explain your answer.

iii) In what sense the slotting operation is different from planing operation?

Question 6

i) Compare soldering and brazing and explain how they differ.

ii) With a suitable sketch show how you use the welding equipment and the work piece in a manual arc welding operation.

iii) What are the different edge preparations in welding practice?

Question 7

iv) Discuss the major difficulties to be experienced when you weld cast–iron. How would you overcome such difficulties?

v) What are the essential requirements of a welding current supply source? Why such requirements are important in arc welding operations?

vi) Explain three types of general defects in gas and arc welding. State the significance of each defect on the quality of weld.

Question 8

(a) Describe, using explanatory sketches where necessary, the construction and use of the dividing head used on a horizontal milling machine.

(b) 67 teeth are required to be machined on a gear blank on a horizontal milling machine using a dividing head. Select the suitable index plate for differential indexing, and calculate the gear ratio. Use following index plates and gears available.
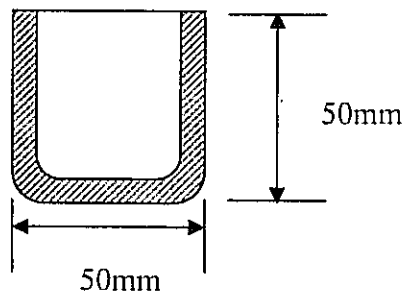
Index Plates available are as follows:

	Number of holes on the plates					
Plate A-	15	16	17	18	19	20
Plate B-	21	23	27	29	31	33
Plate C-	37	39	41	43	47	49

Gears available have the following number of teeth:

Gears – 24 (two gear wheels), 28, 32, 40, 44, 48, 56, 64, 72, 86, and 100.

Question 9

50mm

50mm

Figure

(a) The cup shown in the figure is drawn from a blank. Estimate the theoretical diameter of the blank required to draw this cup. Assume that the thickness of the blank and the cup drawn remain unchanged.

(b) What is the best metal forming operation that can be employed to draw the cup? Sketch and explain the function of the press used for this operation.

(c) What are the major defects in an unsuccessful deep drawing? What precautionary measures should be taken at the planning stage of the product and the drawing operation in order to avoid such defects?