THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DIPLOMA IN TECHNOLOGY-LEVEL 3
FINAL EXAMINATION-2011/2012
MEX 3233 – WORKSHOP TECHNOLOGY

DATE : 13rd March 2012
TIME : 1400-1700hrs
DURATION : 03 hours

Instructions to Candidates:

This question paper consists of eight (08) questions. Answer any five (05) questions.
Marks assigned to each part of a question are indicated against the question.
Wherever necessary, draw neatly drawn sketches to explain your answer.

Question 1

(a) Distinguish each cast Iron, steel and wrought iron from one another. (7 marks)

(b) Explain the processes normally used to convert iron ore into the above three types of metals. (7 marks)

(c) What are the major mechanical properties of mild steel which have made it popular in the industry? (6 marks)

Question 2

(a) Why is a cupola popular in foundry industry? Explain. (5 marks)

(b) Why a cupola is lined with refectory bricks? (3 marks)

(c) Sketch the Iron-Carbon diagram for the range of 0 – 3.0% of carbon in steel by weight. Identify clearly each and every phases that carbon in steel and indicate all critical temperatures. (06 marks)

(d) Consider the steel with carbon composition of 1.5% and referring to the iron-carbon diagram in part (c) above; explain its phase transformations when it is cooled down from 1147^0 C to 0^0 C under equilibrium conditions. (06 marks)

Question 3

(a) What are the changes of physical and mechanical properties of steel when Nickel and Chromium are alloyed with steel? Give a common application of the alloy of Nickel-Chromium steel and state why this alloy is mostly used in this application. (7 marks)

(b) Sketch stress-strain graph for ductile steel and explain the behavior of this material within elastic range and plastic range. (7 marks)

(c) Compare and contrast a brittle fracture from a ductile fracture. (6 marks)

Question 4

(a) Explain MIG welding process and its advantages over other methods of welding. (7 marks)

(b) What are the specific applications of TIG and MIG welding processes in the industry? (5 marks)

(c) Briefly explain following welding processes.

(i) Spot welding (ii) Seam welding (8 marks)

Question 5

(a) Calculate the main spindle speed in rev/minutes for the following stock of material to be turned on the lathe machine. (8 marks)

(i) A brass shaft with diameter of 25mm.

(ii) A cast iron bar with a diameter of 75 mm.

Use following information

Material	**Approximate Cutting Speed (m/min)**
Carbon Steel	12 – 18
Cast iron	18 – 25
Mild steel	20 – 28
Brass	45 – 90
Aluminum	up to 300

(b) Name and briefly explain the gauges used in machining of metals on a centre lathe. (7 marks)

(c) Name five general measuring equipment used in a machining shop and state for what kind of measurements they can be used in a machine shop. (5 marks)

Question 6

(a) Briefly explain the difference between a pattern and a core used in foundry industry. (7 marks)

(b) Write down the major steps involved in making a casting (7 marks)

(c) What are the main materials used in sand moulding? (6 marks)

Question 7

(a) What are the basic features of the following lathe machines? What are their specific uses in a machine shop?

(i) Centre Lathe

(ii) Turret Lathe

(iii) CNC Turret Lathe (9 marks)

(b) Calculate the drilling speeds for following holes on components as given below.

(i) 25 mm diameter hole on a 1" (one inch) thickness brass plate

(ii) 30 mm diameter hole on a 1" (one inch) thickness Medium Carbon steel plate. (5 marks)

Use following information for the above calculations

Material	Cutting Speed (m/min)
Aluminum	70 – 100
Brass	35 – 50
Mild steel	30 – 40
Medium Carbon steel	20 – 30

(c) Sketch relevant views of a simple twist drill bit and explain its drill geometry. (6 marks)

Question 8

(a) In grinding applications the speed of the grinding wheel is generally high. Explain why? (5 marks)

(b) Name two non-traditional machining processes. Explain one of them briefly. (5 marks)

(c) What is blanking process? Why is it economical in the industry? Explain. (5 marks)

(d) Hot metal spray method is largely used in maintenance applications. Explain this process with a suitable example. (5 marks)

ALL RIGHTS RESERVED.