THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
DIPLOMA IN TECHNOLOGY LEVEL 3
FINAL EXAMINATION – 2009

MEX3233 – WORKSHOP TECHNOLOGY

DATE : 23RD MARCH 2010
TIME : 1400 HRS. – 1700 HRS.
DURATION : THREE (03) HOURS

ANSWER ANY FIVE (05) QUESTIONS. ALL QUESTIONS CARRY EQUAL MARKS

QUESTION 01

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

(b) What are the two basic types of cast iron? Briefly explain the properties of each type.

(c) Name frequently used alloying elements. Explain the effect of each alloying element on the properties of steel.

QUESTION 02

(a) List eight important mechanical properties of materials and briefly explain two such properties.

(b) With the aid of a sketch explain briefly the basic electric arc process for the manufacture of steel. State the advantages of this process over the others.

(c) Define the following phases which are present in the iron-carbon phase diagram.

(i) Austenite (ii) Cementite (iii) α-Ferrite (iv) δ-Ferrite

QUESTION 03

(a) Explain what is meant by FCC and BCC structures with the aid of sketches.

(b) Scandium has a FCC lattice structure with a unit cell of length 1.605×10^{-10} m. Determine the packing in the (100) plane in atoms/m^2.

(c) Barium has a BCC lattice structure with a unit cell of length 2.17×10^{-10} m. Determine the packing in the (110) plane in atoms/m^2.

QUESTION 04

(a) Explain the different types of welding flames with the aid of sketches.

(b) "A number of factors should be considered in selecting the amount of current required for a particular welding operation". What are these factors? Explain.

(c) What is meant by "submerged arc welding process"? Explain.

QUESTION 05

(a) Explain the advantages and disadvantages of gas-shielded arc welding over other welding methods.

(b) What are the different types of defects that can occur in an arc weld? Explain.

(c) List the non destructive tests that are normally carried out to test the soundness of a weld. Explain two of them in detail.

QUESTION 06

(a) List the methods used for machining a taper on a lathe. Explain the limitations of each method.

(b) A through hole of 10 mm in diameter is required to be drilled on a work piece made out of aluminium. The thickness through which the work piece has to be drilled is 15 mm. State the step by step procedure to be followed.

Determine the spindle speed of the machine and the time taken for the drilling operation using the information given below.

Cutting speed for aluminimum : 70 – 100 m/min

Feed rates :

Diameter of drill (mm)	Rate of feed (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 07

(a) Explain the characteristics a mould should have in order to produce a sound casting.

(b) What is the purpose of having a "gating system" for a mould? Explain.

(c) What are the special casting techniques? Explain the advantages of such casting techniques over sand casting.

QUESTION 08

(a) Brown and Sharpe milling head is provided with the following index plates.

Plate No. 1 : 15, 16, 17, 18, 19 and 20 holes

Plate No. 2 : 21, 23, 27, 29, 31 and 33 holes

Plate No. 3 : 37, 39, 41, 43, 47 and 49 holes

How do you index the following divisions on a Brown and Sharpe head?

(i) 17 (ii) 22 (iii) 35 (iv) 58

(b) The index plate used on Cincinati and Parkinson milling head is of large diameter than the Brown and Sharpe plates and is reversible. It is provided with the following hole circles.

On one side : 24, 25, 28, 30, 34, 37, 38, 39, 41, 42 and 43 holes.

On the reverse side : 46, 47, 49, 51, 53, 54, 57, 58, 59, 62 and 66 holes.

How do you index the following angles on a Cincinati head?

(i) $6^{o}\ 10'$ (ii) $23^{o}\ 40'$ (iii) 39^{o} (iv) $59^{o}\ 20'$

(c) Explain the factors to be considered in selecting a grinding wheel for a given application.

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