THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF ENGINEERING TECHNOLOGY

DIPLOMA OF TECHNOLOGY – LEVEL 04

FINAL EXAMINATION – 2007

MEX4230 – PRODUCTION TECHNOLOGY- PART B 040

DATE : *MAY 06, 2008*

TIME : *1415 HRS. – 1630 HRS.*

DURATION : *2 HOURS 15 MINUTES*

Answer five questions only.

Question 01

(1.1) Explain the importance of Metrology in Production Engineering.

(1.2) Giving suitable examples, discuss the types of Working Material Standards used in measuring of length.

(1.3) '*The Abbe principle should be complied with when designing linear measuring instruments*' State the Abbe's principle and illustrate a measuring instrument in which this principle followed and in which this principle is not followed. Use a neat sketch to explain your answer.

Question 02

(2.1) State and explain Taylor's principle of limit gauging.

(2.2) Explain the difference between a 'standard gauging system' and a 'limit gauging system'.

(2.3) Find the 'Go' and 'No Go' gauge dimensions of a plug gauge using unilateral and bilateral systems, for gauging of 75 ± 0.05mm holes. Assume a gauge maker's tolerance of 10% and a wear allowance of 5% when designing the above gauges.

Question 03

(3.1) Compare and contrast the different systems of fits for a pair of mating parts.

(3.2) Give the designation for:

(i) 30mm H-hole to the tolerance grade of IT6.

(ii) 30mm f-shaft to the tolerance grade of IT7.

(iii) The above fit.

(3.3) In an assembly of journal and bearing, the basic size is given as 55mm. The lower and upper deviations for the bearing are 0 microns and 4 microns respectively. The corresponding values for the journal are -3 microns and -7 microns. Determine the sizes of the journal and bearing and the type of fit.

Question 04

(4.1) Discuss the main types of spindle speeds available in machine tools.

(4.2) Show that the range ratio (R_n) of spindle speed is dependent only upon the ratio of maximum and minimum diameters of the work-piece and the cutting speeds involved in machining.

(4.3) A machine spindle is to operate on ferrous work-pieces ranging in diameters from 20mm – 40mm at a cutting speed of 20m/min. If the machine is to have eight (08) spindle speeds,

(i) Find the spindle speed using geometrical progression.

(ii) Find the spindle speed using arithmetic progression.

(iii) Explain why geometrical progression is preferred over the arithmetic progression when determining spindle speeds.

Question 05

(5.1) Illustrate positive and negative top rake angle for a single pointed cutting tool. Use neat sketches to explain your answer. Under what conditions are, positive and negative rake angles recommended.

(5.2) Using the idealize chip formation model for orthogonal cutting, obtain an expression for the shear angle (ϕ) in terms of 'rake angle' and 'cutting ratio'. State any assumptions you make during the derivation of the above expression.

(5.3) The following data are available from an orthogonal cutting operation

Depth of cut	*2 mm*
Feed	*0.2 mm/rev*
Chip thickness	*0.4 mm*
Rake angle	10^0
Speed	*200 m/min*

Determine the shear angle for the above operation.

Question 06

(6.1) Enumerate the factors on which tool wear and tool life depend.

(6.2) Explain Taylor's tool life relationship for a cutting tool.

(6.3) The following data was collected according to Taylor's tool life relationship for machining a work-piece with a HSS tool at a feed of 0.2mm/min and a depth of cut of 2 mm.

V (m/min)	25	35
T (min)	90	20

(i) Recommend the cutting speed for a desired tool life of 60 minutes.

(ii) Calculate the percentage increase in tool life if the cutting speed is reduced by 50%.

Question 07

(7.1) Obtain the relationship between;

(i) Engineering stress and true stress.

(ii) Engineering strain and true stain

in the context of metal deformation operations.

(7.2) Explain the 'slab' method used in analyzing stresses and strains in metal deformation processes. Clearly indicate the assumptions in the above method.

(7.3) Using the slab method, find the pressure required for a plain strain open die forging operation involving a rectangular work-piece. (Neglect the effects of friction)

Question 08

(8.1) Briefly explain the following forming processes in relation to metal cutting operations.

(i) Slitting
(ii) Piercing/punching
(iii) Blanking
(iv) Lancing
(v) Notching

(8.2) Discuss the use of 'compound dies' and 'progressive dies' in sheet metal forming operations.

(8.3) Explain the term 'Limiting Draw Ratio' in relation to deep drawing operations and indicate its significance to wrinkling.

END

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