NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

DEPARTMENT OF INDUSTRIAL AND MANUFACTURING ENGINEERING

Bachelor of Engineering Honours Degree Industrial and Manufacturing Engineering

2nd Semester Main Examination

COURSE : MANUFACTURING PROCESSES II

CODE : TIE 3213

DATE : APRIL/MAY 2014

DURATION : 3 HOURS

INSTRUCTIONS AND INFORMATION TO CANDIDATE

1. Answer ANY five questions.
2. All questions carry **20 marks** each.
3. This paper contains seven **(7)** questions.
4. There are four **(4)** printed pages.

QUESTION 1

(a) Indicate some of the advantages of cold working relative to warm and hot working. [8]

(b) Center burst, piping and surface cracking are bulk deformation defects. Give a suitable description of each of the above defects and state the process in which they occur. [12]

QUESTION 2

A continuous hot rolling mill has two stands. Thickness of the starting plate is 25 mm and width 300mm. Final thickness is to be 13 mm. Roll radius at each stand is 250mm. Rotational speed at the first stand is 20 rev/min. Equal drafts of 6 mm are to be taken at each stand. The plate is wide enough relative to its thickness that no increase in width occurs. Under the assumption that the forward slip is equal at each stand, determine

(a) speed (Vr) at each stand, [8]

(b) forward slip (s). [4]

(c) exiting speeds at each rolling stand, if the entering speed at the first stand is 26 m/min. [8]

QUESTION 3

A cylindrical billet that is 100 mm long and 50 mm in diameter is reduced by indirect (backward) extrusion to a 20 mm diameter. The die angle is 90^{o}. The Johnson equation has a = 0.8 and b = 1.4, and the flow curve for the work metal has a strength coefficient of 800 MPa and strain-hardening exponent of 0.13. Determine

(a) extrusion ratio, [2]

(b) true strain (homogeneous deformation), [3]

(c) extrusion strain, [3]

(d) ram pressure, [6]

(e) ram force. [6]

QUESTION 4

A spool of wire has a starting diameter of 2.5 mm. It is drawn through a die with an opening that is to 2.1mm. The entrance angle of the die is 18^0. Coefficient of friction at the work–die interface is 0.08. The work metal has a strength coefficient of 450 MPa and a strain-hardening coefficient of 0.26. The drawing is performed at room temperature. Determine

(a) area reduction, [4]

(b) draw stress, [8]

(c) draw force required for the operation. [8]

QUESTION 5

A drawing operation is used to form a cylindrical cup with inside diameter 75 mm and height 50mm. The starting blank size is 138 mm and the stock thickness is 2.4 mm. Based on this data, is the operation feasible? If so, determine

(a) drawing force [5]

(b) holding force, given that the tensile strength of the sheet metal (low-carbon steel) is 300 MPa and yield strength is 175 MPa. The die corner radius is 6 mm. [15]

QUESTION 6

(a) Name the joints shown on Figure Q6 [5]

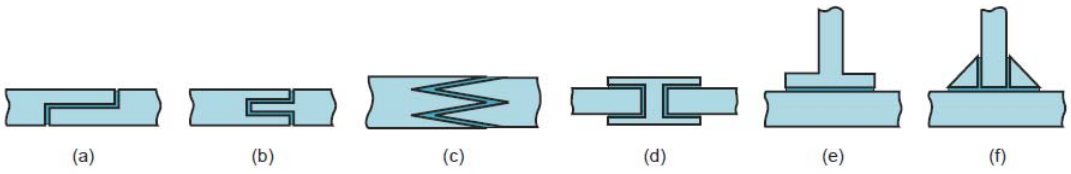

Figure Q6

(b) Clearly define the deference between brazing and soldering. What are five advantages do the two have over welding? [5]

(c) Using clearly labelled diagrams, show how the process of Explosive Welding is achieved. [10]

QUESTION 7

(a) Label and explain the different regions of the heat affected zone of the weld bead, shown in Figure Q7. [8]

(b) Discuss Five (5) weld defects that occur on the weld bead. How can they be avoided. [12]

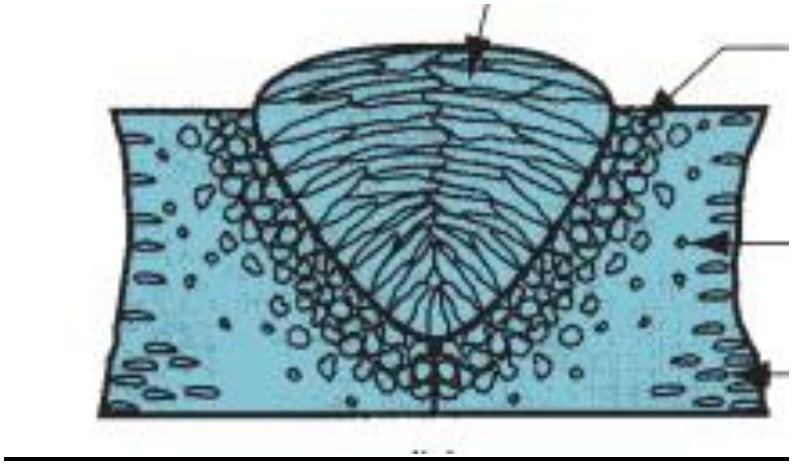

Figure Q7: Weld Bead

END OF EXAMINATION