Final Assessment Test – November 2019

VIT
Vellore Institute of Technology

Course: MEE1007 - Manufacturing Processes
Class NBR(s): 1648 / 1878 / 1882 / 2234 / 6797 Slot: G1
Time: Three Hours Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

General Instructions:

i) Give neat sketches wherever necessary to enhance presentation, whether it is specifically asked or not since they carry 50% weightage of marks allotted for the question.

Answer ALL Questions
(5 X 20 = 100 Marks)

1. a) How do you manufacture a casting when you are given a THREE piece split pattern, green moulding sand and all the foundry tools? Explain step by step procedure briefly with a neat sketch. [12]

   b) A jeweller wishes to produce 24 gold rings in one investment-casting operation. The wax parts are attached to a wax central sprue of 12 mm in diameter. The rings are located in four rows, each 12 mm from the other on the sprue. The rings require a 3 mm diameter, 12 mm-long runner to the sprue. Estimate the weight of gold needed to completely fill the rings, runners and sprues. The specific gravity of gold is 19.3. [8]

   Assume

   i) Typical ring as a tube with dimensions of 25 mm outer diameter, 16 mm inner diameter and 10 mm width.

   ii) Central sprue has a length 38 mm.

   iii) Neglect the weight of metal in the pouring basin.

2. a) If a copper lid is to be welded on a Copper Canister used for nuclear fuel disposal after use, suggest the most suitable welding technique and explain its working principle with a neat sketch? [13]

   b) A resistance spot-welding operation is performed on two pieces of 1.5 mm-thick steel sheets using a current of 12,000 A for a period of 0.20 s. The electrodes are 6 mm in diameter at the contacting surfaces. Resistance is assumed to be 0.0001 Ω, and the resulting disc shaped weld nugget is 6 mm in diameter and 2.5 mm thick. Assuming the unit melting energy for the metal (Um) = 12.0 J/mm^3. Calculate the percentage heat dissipation in this operation. [7]

a) Write short notes with neat sketch on: i) Impact extrusion and ii) Hydro-static extrusion mentioning their advantages and applications? [10]

b) In a metal rolling operation, 4 mm thick sheet is rolled with 300 mm diameter rolls to reduce thickness without any change in its width. The friction coefficient at the work-roll interface is 0.1. [10]

   i) Calculate the minimum possible thickness of the sheet that can be produced in a single pass?

   ii) Calculate roll strip contact length.

Explain how metallic powders are prepared using atomization process by gas with a neat sketch. Also, explain the working principle of Vacuum thermoforming with a neat sketch and state its advantages and limitations?

Explain the procedure for process selection with a schematic flow chart. Also, explain your case study procedure for making Spark plug insulator.