Ganpat University
M.Tech.Sem II (CAD/CAM) Mechanical Engineering
Regular Examination May-June 2012
Sub.: 3ME 212 Advanced Casting & Welding Processes

Time: 3 Hours **Total Marks: 70**

Instructions: 1) Answer two sections separately.
2) Figures to the right indicate full marks.
3) Assume suitable data if necessary.

Section I

Q-1 **11**

(a) What is investment casting process? Explain process steps with neat sketch. Differentiate between shell moulding and investment casting process.

(b) Enlist advantages, limitations and applications of investment casting process.

(c) What is continuous casting? Enlist metallurgical characteristics of continuous cast parts. Also enlist and explain defects in continuous casting.

OR

Q-1 **11**

(a) What is solidification? Differentiate between amorphous and directional solidification.

(b) What is segregation? Differentiate between micro and macro segregation.

(c) What is nucleation? Differentiate between homogeneous nucleation & heterogeneous nucleation.

Q-2 **12**

(a) Differentiate between steel and cast iron. Also differentiate between gray and nodular cast iron with respect to its microstructure, properties and applications.

(b) Classify casting defects along with its causes and remedies.

(c) Differentiate between moulding sand and core sand. Enlist ingredients of moulding sand, characteristics of moulding sand and role of additives in moulding sand.

OR

Q-2 **12**

(a) Enlist and explain basic principles of gating system and feeder head in metal casting.

(b) What is gating ratio? Differentiate between single gating and multiple gating systems. Also differentiate between top and bottom gating system.

(c) Explain the role of following aids for promoting directional solidification:
i) Insulating materials ii) Chills iii)Padding iv)Topping up

Q-3 **12**

(a) Explain basic principles of non-ferrous foundry practice with respect to following:
i) Dissolution of gases in metals
ii) Grain refinement and modification of aluminum alloy

(b) Explain the effects of following process variables on mechanical properties of centrifugal casting:
   i) Mould rotation speed
   ii) Pouring rate
   iii) Mould coat thickness

(c) Write short notes on: Vacuum casting

Section II

Q-4 12

(a) Discuss oxidizing, carburizing and neutral flame with respect to its characteristics and application area.

(b) Explain "Shielded Metal Arc Welding" process with neat sketch in detail.

(c) Explain the process of "Plasma Arc Welding" in detail along with advantages, limitations and applications.

OR

Q-4 12

(a) Explain any one "Non-consumable electrode" type welding process with neat sketch.

(b) Explain the "Heat Balance" in case of resistance welding.

(c) Explain the criteria for selection of electrodes for a particular process of arc welding.

Q-5

(a) Explain the "Gas Metal Arc Welding" process along with its metal transfer process. 6

(b) Explain the "Laser Beam Welding". Also differentiate LBW and EBW. 5

OR

Q-5

(a) What do you mean by solid state welding? Explain any two in detail with neat sketch. 6

(b) A GTAW operation is performed at a current of 300 A and voltage of 20 V. The melting efficiency f_2=0.5 and the unit melting energy of the metal U_m=10 J/mm^3. Determine (a) power in the operation, (b) rate of heat generation at the weld and (c) volume rate of metal welded.(For GTAW, f_1=0.7) 5

Q-6 **Answer the following: (Any Three)** 12

(a) Differentiate and explain types of "Underwater Welding Process."

(b) Write a short note on "Weld Defects."

(c) Explain the "Flux Cored Arc Welding" with neat sketch.

(d) Write a short note on "Weld Position".

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