Ex/Met/T/423//2017(Old)

Name of the Examinations: B.E METALLURGICAL AND MATERIAL ENGINEERING FOURTH YEAR SECOND SEMESTER (Old) - 2017

Subject: METAL JOINING AND POWDER METALLURGY

Full Marks: 100 **Time: Three Hours**

Instruction: use separate answer scripts for each part

Part-I (70 marks)

Answer Question No.1 and any two from the rest

1. (a) What is 'arc' used in welding? **15 X 2 = 30**
   (b) How arc is initiated?
   (c) How does the arc become self-sustaining?
   (d) What is plasma jet and how it is beneficial?
   (e) What are the functions of coating in coated electrode?
   (f) Why heat input is an important parameter in fusion welding?
   (g) How does heat intensity differ from the heat input on fusion welds?
   (h) Why hydrogen is responsible for the formation of porosity in Al?
   (i) How does the Ellingham diagram become useful to the welding engineer?
   (j) How solidification of welding differs from casting solidification?
   (k) How does weld pool shape control the grain size of weld metal?
   (l) How does the substructure varies from the fusion zone boundary to central axis of the weld?
   (m) What is HAZ? Why it is always a headache to the welding engineer?
   (n) Why penetration is very important to the welding engineer?
   (o) Why heat is prerequisite for any welding?

2. (a) Give an account of chronological order of formation of various microstructural constituents formed during continuous cooling of weld metal of low alloy steel and give reason.
   (b) State the mechanisms of hot cracking and illustrate the possible remedies using examples with no. of alloys. **10+10**

3. (a) Define weldability and factors affecting weldability. Discuss the welding characteristics of austenitic stainless steel and Aluminium alloys.
   (b) State the problems posed by dissimilar welding. Discuss with examples how those problems could be minimized? **14 +6**

4. (a) Why application of GMAW process is increasing steadily? Justify with examples.
   (b) Discuss how one can establish weld procedure for a given steel without trial and error? **10 + 10**

5. (a) Why dropping type power source is not suitable for process like GMAW? What do you mean by 'duty cycle'? How continuous welding is possible with a power source whose duty cycle is 60% at a rated current of 300 amps. **8**

(b) i)Why cast iron is difficult to weld than mild steel?

ii) Why distortion is common to all the fabricated structures? What are the approaches encountered to minimize distortion? Explain the distortion expectancy among stainless steel, mild steel and Aluminium. **4+ 8**

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B.E. Metallurgical and Material Engineering 4th year 2nd Sem. Examination -2017(Old)

Subject: Metal Joining & Powder Metallurgy

Time : Three Hours **Full Marks: 100**

Part-11 **Marks: 30**

Answer Q. no. one & any one from the rest.

1. Write the various applications of powder Metallurgy. 10

2. i). Describe the various Production methods of powders. 20

10+10

3. i). What is Powder Metallurgy?. Write the different steps involved in Powder Metallurgy.

   ii). The density of Al_2O_3 is about 3.85 Mgm^{-3}. A SAP Aluminium alloy is produced by powder metallurgy processing using powder particles having a diameter of 0.01 mm with an oxide coating of 0.0001 mm. A dispersion of spherical oxide particles 0.005mm in diameter is produced. Calculate (a). the vol% Al_2O_3 present in the SAP (b). the density of the SAP alloy, and (c). the number of oxide particles per 1000g of alloy.