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Total Number of Pages: 02

B.TECH
PMT3I104

3rd Semester Regular Examination 2016-17

MATERIALS PROCESSING

BRANCH(S): METTA, MME

Time: 3 Hours

Max Marks: 100

Q.CODE: Y643

**Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.**

Part – A (Answer all the questions)

Q1 Answer the following questions: (2 x 10)

- a) The small amount of carbonaceous material sprinkled on the inner surface of the mould cavity to give a better surface finish to the castings is called _____ and a separate part of the mould, made of sand and generally baked, which is used to create openings and various shaped cavities in the castings is called _____.
- b) The upper part of the sand mould is called _____ and that of lower part is called _____.
- c) The temperature at which metal starts to melt during heating is called _____ and the temperature at which the metal starts to solidify during solidification is called _____.
- d) _____ process is used for removing the volatile materials of shell at around _____⁰C in investment casting process.
- e) Gating ratio of pressurized casting is _____ and that of unpressurised casting is _____.
- f) _____, _____ and molten metals are hidden in submerged arc welding.
- g) _____ and _____ are the most dependable factors for resistance welding process.
- h) _____ is the invested materials which can be surrounded with _____ to making the mould in investment casting.
- i) _____ is used for making of pattern.
- j) _____ polarity current is preferred for single carbon arc welding to restrict the _____.

Q2 Answer the following questions: (2 x 10)

- a) Draw the cooling curves of alloy and pure metal.
- b) What are chaplets and give its function?
- c) Define weldability.
- d) Define Apparent density.
- e) What is backing sand?
- f) What is the difference between impregnation and infiltration?
- g) Express the term "long freezing range".
- h) Define 'core'.
- i) What do you mean by "misrun"?
- j) Why tapered sprue is more suitable than a straighter sprue?

Part – B (Answer any four questions)

- Q3** a) Describe the different moulding processes. Explain the purpose of using different fluxes, binders with examples. (10)
b) Explain the elements of gating systems with sketches. Describe their functions in the casting process. (5)
- Q4** a) Describe the different types of pattern and pattern allowances required in casting process. (10)
b) In casting experiments performed using a certain alloy and type of sand mold, it took 155 sec for a cube shaped casting to solidify. The cube was 50mm on a side.
a) Determine the value of mould constant in Chvorinov's Rule. (5)
b) If the same alloy and mould type are used find the total solidification time for a cylindrical casting in which the diameter $r=15\text{mm}$ and height $h=50\text{mm}$.
- Q5** a) Describe the defects that are generally found in welding. And explain the causes of the welding defects and their remedies. (10)
b) Express the advantages and disadvantages of welding process over other manufacturing process. (5)
- Q6** a) Explain the powder metallurgy process with block diagram. What are the advantages and disadvantages of powder metallurgy process over other manufacturing processes? (10)
b) A copper alloy powder has an apparent density of 3000kg/m^3 and tap density of 4000kg/m^3 . The powder is compacted in a cylindrical die at 300 MPa to a green density of 6000kg/m^3 . Subsequently the compact is sintered to a density of 7500kg/m^3 . The theoretical density of the alloy is 9000kg/m^3 .
a) Determine the initial fill height in mm if the powder is compressed to 10mm height. (5)
b) Determine the densification parameter of the sintered compact.
- Q7** a) Explain the different types of fabrication processes. Explain the advantages and disadvantages of casting process over other manufacturing process. (10)
b) Explain the Hot Isostatic Pressing (HIP) process of compaction of metal powders with the help of a suitable diagram. (5)
- Q8** a) Describe the metallurgical principles of gas welding process. Explain the types of flames used for gas welding process. (10)
b) Explain the metallurgical principles involved in welding of alloy steel. (5)
- Q9** a) Describe the different types of material transport mechanisms of sintering. (10)
b) What are the stages of liquid phase sintering? Explain the mechanism of liquid phase sintering. (5)