

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April/May 2016

B. Tech. In Mechanical Engineering, Semester IV

Roll No.....

ME405: Casting, Welding & Forming

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1 Objective type questions (10 x 1 mark)

10

A

- i. In sand casting, fluidity of the molten metal increases with
(a) increase in degree of superheat (b) decrease in pouring rate
(c) increase in thermal conductivity of the mould (d) increase in sand grain size
- ii. Hot chamber die casting process is NOT suited for
(a) Lead and its alloys (b) Zinc and its alloys
(c) Tin and its alloys (d) Aluminum and its alloys
- iii. In hollow cylindrical parts, made by centrifugal casting, the density of the part is
(a) maximum at the outer region (b) maximum at the inner region
(c) maximum at the mid-point between outer and inner surfaces
(d) uniform throughout
- iv. Which of the following is not a casting defect
(a) Swab (b) Scab (c) Swell (d) Shift
- v. Which of the following processes is used to manufacture products with controlled porosity?
(a) Casting (b) Welding (c) Forming (d) Powder metallurgy
- vi. Match the following metal forming processes with their associated stresses in the workpiece.

Metal forming process

Type of stress

- | | |
|------------------------|----------------------------|
| 1. Coining | P. Tensile |
| 2. Wire Drawing | Q. Shear |
| 3. Blanking | R. Tensile and compressive |
| 4. Deep Drawing | S. Compressive |
| (a) 1-S, 2-P, 3-Q, 4-R | (b) 1-S, 2-P, 3-R, 4-Q |
| (c) 1-P, 2-Q, 3-S, 4-R | (d) 1-P, 2-R, 3-Q, 4-S |



- vii. Which of the following statement(s) is/are true for resistance welding?
 i) The time for which current flows is very important
 ii) After switching off the current, the pressure is maintained until the weld cools
 iii) Water is circulated through hollow electrodes to cool the electrodes
 a) i & ii (b) i & iii (c) ii & iii (d) i, ii & iii
- viii. Spherical powders can be obtained only by
 (a) milling (b) electrolysis (c) Atomization (d) reduction of oxides
- ix. In a rolling process, the roll separating force can be decreased by
 (a) reducing the roll diameter (b) increasing friction between the rolls and the metal
 (c) reducing front tension to rolled material (d) providing back-up rolls
- x. Which pair among the following solid state welding processes uses heat from external source?
 P-Diffusion welding; Q-Friction welding; R-Ultrasonic welding; S-Forge welding
 (a) P and R (b) R and S (c) Q and S (d) P and S

Q.1B Answer the following questions in short (4 x 2.5 marks)

10

- a) Describe the objectives of gating systems in any casting
- b) 'You cannot put the green compact containing binders and lubricants directly in a high temperature furnace for sintering' ---- why? What steps would you take to combat this problem for removing these additives?
- c) What is the significance of recrystallization temperature in metal working?
- d) Draw and label the schematic diagram of electron beam welding setup with workpiece in non-vacuum conditions

Q.2A Sketch the cross-section of a sand mould which is ready for pouring, and label the various important parts. Define the terms (a) cope (b) drag (c) bottom board related to casting.

05

Q.2B List the different types of patterns used in casting process. Explain with figure the pattern which is used for small castings with higher dimensional accuracy and large production.

05

Q.3A Find the weight that need to be kept to compensate for the forces during the pouring in a sand casting iron pipe of 12.5 cm OD and 10 cm ID with a length of 180 cm. the metal head is to be about 20 cm, while the moulding flask size used for the purpose is 200 x 25 x 20 cm in size. Take the dencity of the core sand to be 0.0165 N/cm² and the liquid metal density to be 0.0771 N/cm³.

05

Q.3B Describe the pattern colour code normally used in foundries.

05

Q.4A Compare the bottom gate with top gate vis-à-vis its merits and demerits.

05

Q.4B Enumerate some common casting defects and explain the reasons which causes defects.

05



Q.5A	Define the powder metallurgy (PM) process and give a brief account of the basic steps in the P/M technique.	05
Q.5B	Briefly enumerate the steps in sequence for producing castings from shell moulding.	05
OR		
Q.5B	Outline the precision investment casting process giving typical applications of the process	05
Q.6A	List the advantages and limitations of tape casting method.	05
Q.6B	What is the atomization process for manufacturing metal powders? Draw a neat sketch to show this process	05
OR		
Q.6B	Briefly explain the working principle of injection moulding process with a neat sketch.	
Q.7A	What are the kinds of joints that are normally employed for welding purposes? Give their sketches.	05
Q.7B	Explain the procedure of manual metal arc welding process.	05
Q.8A	Determine the die and punch sizes for blanking a circular disc of 20 mm diameter from a C20 steel sheet whose thickness is 1.5 mm and also Punching force and Stripping force required to make a blank. Shear strength of annealed C20 steel is 294 MPa.	05
Q.8B	What are the advantages and disadvantages of hot working over cold working of metals?	05
Q.9A	i) Describe the types of flames obtained in an oxy-fuel gas welding process giving the applications. ii) Write a note on the plasma arc welding process	05 05
OR		
Q.9B	i) Explain with sketches the difference between direct and indirect extrusion ii) List the types of rolling mills. Explain the working principle of planetary rolling mill with neat sketch.	05 05

