



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 4 Examination in Engineering: September 2023

Module Number: ME4304

Module Name: Manufacturing Engineering

[Three Hours]

[Answer all questions]

Question paper consists of two parts. Part I: Essay and Part II: MCQ.

Part I: Essay Questions

Answer all questions. Each question carries 12.0 marks.

- Q1. a) Explain the basic working principle of metal rolling with neat sketches. [3.0 Marks]
- b) Mention three (03) products that can be made by rolling process? Provide reasons to use rolling process for your products manufacturing. [3.0 Marks]
- c) What is deep drawing? Explain with neat sketches. [3.0 Marks]
- d) What are the general advantages (03) of forging as a manufacturing process compared to other manufacturing processes? [3.0 Marks]
- Q2. a) Differentiate between solid state welding and fusion (liquid state) welding. [3.0 Marks]
- b) Explain the 'principle of resistance welding'. [3.0 Marks]
- c) What do you mean by 'high voltage arc' and 'low voltage arc' and which one is used in welding? [3.0 Marks]
- d) Describe the process of Gas Metal Arc Welding (GMAW) with neat sketches. [3.0 Marks]
- Q3. a) What process would you choose for making the following components (need explanation for choice of the process)?
- I A turbine blade in a jet engine needs to be fabricated using high melting point nickel-based alloy
 - II A pump casing in a domestic central heating system needs to be fabricated using aluminium-silicon
- [3.0 Marks]
- b) Describe the requirements of a good pattern in sand casting. [3.0 Marks]

c) Describe three (03) functions of the riser in a sand mould.

[3.0 Marks]

d) Describe the shell moulding process with neat sketches.

[3.0 Marks]

Q4. Explain three (03) out of following manufacturing processes with aid of neat sketches. Your explanations should consist of working principles, advantages, and limitations.

a) Thermite Welding

b) Brazing

c) Extrusion

d) Spinning

[12.0 Marks]

- 7) Permeability can be defined as the property of moulding sand
- a) to hold sand grains together.
 - b) to allow gases to escape easily from the mould.
 - c) to withstand the heat of melt without showing any sign of softening.
 - d) none of the above.
- 8) Which of the following sentence/s is/are correct for casting process?
- a) Casting process is comparatively costly
 - b) Objects of larges sizes cannot be produced easily by casting process
 - c) The time required for the process of making casting is quite long
 - d) All the above sentences are correct
- 9) Which casting process has no size and shape limits?
- a) Sand casting
 - b) Shell-mould casting
 - c) Plaster-mould casting
 - d) None of the above
- 10) The productivity of casting process is comparatively
- a) lower than the productivity of other automatic processes like rolling.
 - b) higher than the productivity of other automatic processes like rolling.
 - c) similar to the productivity of other automatic processes like rolling.
 - d) unpredictable.
- 11) Thermit Welding is a form of
- a) fusion welding.
 - b) gas welding.
 - c) arc welding.
 - d) resistance welding.
- 12) Which of the following welding processes uses non-consumable electrodes?
- a) TIG welding
 - b) MIG welding
 - c) SMAW Welding
 - d) Submerged arc welding
- 13) The thermit welding develops heat due to chemical reaction between
- a) Aluminium oxide and zinc.
 - b) Iron oxide and zinc.
 - c) Aluminium oxide and finely powdered iron.
 - d) Iron oxide and finely powdered aluminium.

- 14) In submerged arc welding, the arc is struck between
- a) consumable coated electrode and work piece. c) consumable bare electrode and work piece.
b) non-consumable electrode and work piece. d) Tungsten electrodes and work piece.
- 15) If there is no melting of the edges of the base metal at the root face or on the side face or between the weld runs, then it is
- a) lack of penetration. c) burn through.
b) lack of fusion. d) excessive penetration.
- 16) The gases used in tungsten inert gas welding are
- a) helium and neon. c) ozone and neon.
b) argon and helium. d) None of these.
- 17) Two plates, each of 6 mm thickness, are to be butt-welded. Consider the following processes and select the correct sequence in increasing order of size of the heat affected zone.
1. Arc welding
 2. MIG welding
 3. Laser beam welding
 4. Submerged arc welding
- a) 1-4-2-3 c) 4-3-2-1
b) 3-4-2-1 d) 3-2-4-1
- 18) Which of the following is a step of powder metallurgy?
- a) The production of metal powder c) The compaction and shaping of the powder
b) The consolidation and fusing of the powder into a solid metal d) All the mentioned
- 19) What is powder sintering process?
- a) Cold treatment used to improve a material's strength and structural integrity c) Thermal treatment used to improve a material's strength and structural integrity
b) Metal freezed to improve its strength and structural integrity d) None of the mentioned

- 20) Which of the following are the essential parts of a sintering furnace?
- a) Burn-off zone, sintering zone, and cooling zone c) Burn-on zone, sintering zone, and cooling zone
b) Sintering zone and cooling zone d) Preheat zone and sintering zone
- 21) Following is the process used to form powder metal to shape.
- a) Sintering c) Isostatic moulding
b) Explosive compacting d) All of these
- 22) Following is not a characteristic of powder metallurgy.
- a) Complex shapes can be produced c) Cost effectiveness
b) Bimetallic and laminated parts can be made d) Low production rates due to complex shapes
- 23) Advantages of cold working. Identify the correct statement(s).
- a) Grain structure of metal is refined c) The porosity of the metal is largely eliminated
b) Closer tolerances can be maintained, and desirable directional properties can be achieved d) None
- 24) In hot working process
- a) possibility of crack formation and its propagation is great. c) uniformity of materials is lost and the properties are affected.
b) cracks and blow holes are welded up. d) internal and residual stresses are developed in the metal.

Answer-sheet for the MCQs (Part II)

Index Number:

Question	Answer			
	a)	b)	c)	d)
1)	a)	b)	c)	d)
2)	a)	b)	c)	d)
3)	a)	b)	c)	d)
4)	a)	b)	c)	d)
5)	a)	b)	c)	d)
6)	a)	b)	c)	d)
7)	a)	b)	c)	d)
8)	a)	b)	c)	d)
9)	a)	b)	c)	d)
10)	a)	b)	c)	d)
11)	a)	b)	c)	d)
12)	a)	b)	c)	d)

Question	Answer			
	a)	b)	c)	d)
13)	a)	b)	c)	d)
14)	a)	b)	c)	d)
15)	a)	b)	c)	d)
16)	a)	b)	c)	d)
17)	a)	b)	c)	d)
18)	a)	b)	c)	d)
19)	a)	b)	c)	d)
20)	a)	b)	c)	d)
21)	a)	b)	c)	d)
22)	a)	b)	c)	d)
23)	a)	b)	c)	d)
24)	a)	b)	c)	d)