PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF MECHANICAL ENGINERING

EXAMINATION QUESTION PAPERS

ME 314
MANUFACTURING PROCESS AND DESIGN

SEMESTER ONE – 2024

BY GK

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

MECHANICAL ENGINEERING –3RD YEAR DEGREE

SECOND SEMESTER EXAMINATIONS – 2024

ME 314 – BASIC MANUFACTURING PROCESS AND DESIGN

THURSDAY, 30TH MAY 2024 – 12:50 PM

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES

1. You have 10 minutes to read the paper. You **must not** begin writing during this time.
2. Answer **All the** questions.
3. **Use only ink.** Do not use pencil for writing except for drawings and sketches.
4. Start each question on a new page and show all your calculations in the answer book provided. No other written material will be accepted.
5. Write your **NAME** and **NUMBER** clearly on the front page. **Do it now.**
6. Calculators are permitted in the examination room. Notes and textbooks are not allowed.

MARKING SCHEME:

Question Number	SLO	Marks	%
Question Number 1	SLO2	05	12.5%
Question Number 2	SLO3	05	12.5%
Question Number 3	SLO3	10	25%
Question Number 4	SLO4	05	12.5%
Question Number 5	SLO4	10	25%
Question Number 6	SLO5	05	12.5%

Question Number 1 *(5 marks)*

Discuss various defects of sand castings with neat sketches and suggest remedial measures.

Question Number 2 *(5 marks)*

A solid cylindrical slug made of 304 stainless steel is 150 mm in diameter and 100 mm high. It is reduced in height by 50% at room temperature by open-die forging with flat dies. Assuming that the coefficient of friction is 0.2, calculate the forging force at the end of the stroke.

Question Number 3a *(5 marks)*

In a single pass rolling operation, a 20 mm thick plate width of 100 mm, is reduced to 18 mm. The roller radius is 250 mm and rotational speed is 10 rpm. The average flow stress for the plate material is 300 MPa. What is the power required for the rolling operation in kW is closest to?

Question Number 3b *(5 marks)*

Explain the different ways by which changing the die angle affects the extrusion process.

Question Number 4 (5 marks)

Discuss various types flames obtained during oxy-acetylene gas welding with neat sketch

Question Number 5a (6 marks)

A low carbon steel plate is to be welded by the manual metal arc welding process using a linear V - I characteristic DC Power source. The following data are available :

OCV of Power source = 62 V

Short circuit current = 130 A

Arc length, L = 4 mm

Traverse speed of welding = 15 *cm/s*

Efficiency of heat input = 85%

Voltage is given as V = 20 + 1.5 L

Calculate the heat input into the work picce

Question Number 5b (4 marks)

Differentiate between Straight and Reverse Polarity

Question Number 6 (5 marks)

Explain the various design considerations for powder metallurgy with neat sketches

Material	K (MPa)	n
Aluminum, 1100-O	180	0.20
2024-T4	690	0.16
5052-O	210	0.13
6061-O	205	0.20
6061-T6	410	0.05
7075-O	400	0.17
Brass, 7030, annealed	895	0.49
85-15, cold rolled	580	0.34
Bronze (phosphor), annealed	720	0.46
Cobalt-base alloy, heat treated	2070	0.50
Copper, annealed	315	0.54
Molybdenum, annealed	725	0.13
Steel, low carbon, annealed	530	0.26
1045 hot rolled	965	0.14
1112 annealed	760	0.19
1112 cold rolled	760	0.08
4135 annealed	1015	0.17
4135 cold rolled	1100	0.14
4340 annealed	640	0.15
17-4 P-H, annealed	1200	0.05
52100, annealed	1450	0.07
304 stainless, annealed	1275	0.45
410 stainless, annealed	960	0.10

Note: 100 MPa = 14.500 psi.

Typical values for K and n at room temperature