



**GWANDA STATE UNIVERSITY**  
**FACULTY OF ENGINEERING AND ENVIRONMENT**  
**DEPARTMENT OF METALLURGICAL ENGINEERING**  
**MANAGEMENT FOR PROCESS ENGINEERS**  
**EMG 5202**  
**Part V Second Semester Examination Paper**  
**May 2024**

This examination paper consists of 4 printed pages

**Time Allowed: 3 Hours**

**Total Marks: 100**

**Lecturer : Eng Charles Mazemo**

**INSTRUCTIONS**

1. Answer **ALL** questions in **Section A** and any **TWO** from **Section B**
2. Each question carries 25 marks
3. Use of calculators is permissible

**MARK ALLOCATION**

Section A	50 Marks
Section B	50 Marks
Part Questions	As shown in each part question

Total Attainable	100
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**SECTION A (50 MARKS)**

**ANSWER ALL QUESTIONS**

**USE THE INFORMATION BELOW TO ANSWER QUESTIONS A1 AND A2**

**Question A1**

Hwange Colliery Company produces two types of products thermal coal and metallurgical coke. The profits per tonne of the two products are \$30 and \$40 respectively. These two products require processing in three types of plants. Table A1 shows the available plant hours per day and the time required on each plant to produce one tonne of thermal coal and metallurgical coke. Formulate the problem in the form of linear programming model and determine the product distribution that the company must target to produce in order to maximize total profit contribution. **[25 Marks]?**

**Table A1**

Product	Thermal Coal	Metallurgical Coke	Total Available Plant Hours Per day
Profit Per Tonne	\$30	\$40	
Plant 1	3	2	600
Plant 2	3	5	800
Plant 3	5	6	1100

**Question A2**

- a) Determine the idle capacity in each production plant **[5 Marks]**
- b) Due to the increased power demand Hwange Colliery management is concerned about the fluctuations in prices of raw materials, product demand and stock prices. Determine the profit contribution range per tonne that the marketing department must negotiate within in order to maintain the product distribution determined in Question A1 **[20 Marks]?**

**SECTION B (50 MARKS)**

**ANSWER ANY TWO QUESTIONS**

**Question 2**

- a) Some business people think that inventory is a necessary evil while others think inventory is an asset. critic your view? **[15 Marks]**
- b) Explain the terms: event, predecessor event, successor event, activity, dummy activity as used in project management **[10 Marks]**

### Question 3

a) Discuss the stages of a project life cycle giving practical examples. [10 Marks]

b) You and several friends are about to prepare a lasagna dinner. The tasks to be performed, their immediate predecessors, and their estimated durations are as follows

Task	Task Description	Tasks that	
		Must Precede	Time
A	Buy the mozzarella cheese*		30 minute
B	Slice the mozzarella	A	5 minutes
C	Beat 2 eggs		2 minutes
D	Mix eggs and ricotta cheese	C	3 minutes
E	Cut up onions and mushrooms		7 minutes
F	Cook the tomato sauce	E	25 minute
G	Boil large quantity of water		15 minute
H	Boil the lasagna noodles	G	10 minute
I	Drain the lasagna noodles	H	2 minutes
J	Assemble all the ingredients	I, F, D, B	10 minute
K	Preheat the oven		15 minute
L	Bake the lasagna	J, K	30 minute

- Construct the project network for preparing this dinner.
- Find all the paths and path lengths through this project network. Which of these paths is a critical path?
- Find the earliest start time and earliest finish time for each activity.
- Find the latest start time and latest finish time for each activity.
- Find the slack for each activity. Which of the paths is a critical path?
- Because of a phone call, you were interrupted for 6 minutes when you should have been cutting the onions and mushrooms. By how much will the dinner be delayed? If you use your food processor, which reduces the cutting time from 7 to 2 minutes, will the dinner still be delayed? [15]

### Question 4

Alpha Limited produces coat racks. The projected sales for the first quarter of the coming year and beginning and ending inventory data are as follows:

Sales in units	100 000
Unit price	\$15

Units in beginning inventory	8 000
Units in targeted ending inventory	12 000

The coat racks are moulded and then painted. Each rack requires 2 kg of metal, which costs \$2.5 per kg. The beginning inventory of materials is 2 000 kg. Alpha Limited wants to have 3 000 kg of metal in inventory at the end of the quarter. Each rack produced requires 30 minutes of direct labour time, which is billed at \$9.00 per hour. The standard cost per rack is \$11.00.

Required:

Prepare the following budgets for the first quarter:

- (a) Sales budget;
- (b) Production budget;
- (c) Direct materials purchases budget;
- (d) Direct labour budget    **[25 Marks]**

**END OF QUESTION PAPER**