



**THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY**  
**DEPARTMENT OF ELECTRICAL AND COMMUNICATIONS**  
**ENGINEERING**

**FIRST SEMESTER EXAMINATION - 2021**

**EE413 OPERATION RESEARCH & QUALITY CONTROL**

**YEAR 4 ELECTRICAL AND COMMUNICATIONS**  
**ENGINEERING – (BEEC/4; BEEP4)**

**TIME ALLOWED: 2 HOURS & 30 Minutes**

**INFORMATIONS FOR STUDENTS**

- 1) You have **TEN (10) MINUTES** to read the paper.  
You must not begin writing during this time.
- 2) **Answer any Five (5) questions.** All answers must be written in the **ANSWER BOOK** supplied. The paper is worth 50 Marks.
- 3) **COMPLETE THE DETAILS REQUIRED ON THE FRONT COVER OF YOUR ANSWER BOOK – DO THIS NOW.**
- 4) Only drawing instruments and calculators are permitted on your desk. **NO** phones allowed.
- 5) If you are found cheating in the Examination, the penalties specified by the University shall apply.
- 6) **TURN OFF** all Mobile Phones and Electronic Gadgets and place them on the floor under your seat before the start of Examination

**QUESTION ONE (10 marks)**

A company manufactures two products, X and Y by using three machines A, B, and C. Machine A has 4 hours of capacity available during the coming week. Similarly, the available capacity of machines B and C during the coming week is 24 hours and 35 hours respectively. One unit of product X requires one hour of Machine A, 3 hours of machine B and 10 hours of machine C. Similarly, one unit of product Y requires 1 hour, 8 hour and 7 hours of machine A, B and C respectively. When one unit of X is sold in the market, it yields a profit of Rs. 5/- per product and that of Y is Rs. 7/- per unit. Solve the problem by using graphical method to find the optimal product mix.

**QUESTION TWO (10 marks)**

Solve by Simplex Method

Maximize  $z = 70X + 50Y$

$$\text{St } 4X + 3Y \leq 240$$

$$2X + Y \leq 100$$

$$X, Y \geq 0$$

**QUESTION THREE (10 marks)**

Four persons A, B, C and D are to be assigned four jobs I, II, III and IV. The cost matrix is given as under, find the proper assignment that will reduce overall cost of assignment

<b>Man/Job</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>I</b>	8	10	17	9
<b>II</b>	3	8	5	6
<b>III</b>	10	12	11	9
<b>IV</b>	6	13	9	7

**QUESTION FOUR (10 marks)**

Construct  $\bar{X}$  and R charts for the data given in the following table

Sample	Slip Ring Diameter(cm)				
	1	2	3	4	5
1	5.02	5.01	4.94	4.99	4.96
2	5.01	5.03	5.07	4.95	4.96
3	4.99	5.00	4.93	4.92	4.99
4	5.03	4.91	5.01	4.98	4.89
5	4.95	4.92	5.03	5.05	5.01
6	4.97	5.06	5.06	4.96	5.03
7	5.05	5.01	5.10	4.96	4.99
8	5.09	5.10	5.00	4.99	5.08
9	5.14	5.10	4.99	5.08	5.09
10	5.01	4.98	5.08	5.07	4.99

**QUESTION FIVE (5 + 5 = 10 marks)**

- a) What do you mean by a Process Capability? Discuss the various benefits of process capability study.
- b) Differentiate between Control Charts for Attributes and Control Charts for Variables

**QUESTION SIX (5 + 5 = 10 marks)**

Write short notes on any Two

- a) Transportation problem.
- b) Quality Control
- c) Linear programming Problem