Subject: Mathematics **Code: BIBMT 3214**

ASSIGMENT

LECTURER: MADAM ROZLINDA **Session: May 2023**
DUE DATE: 22 AUGUST 2023 (WEEK 14)

You are instructed to complete an assignment. Answer and complete ALL questions.

- Answer the following questions in A4 paper.
- Submit your answer script together with cover pages during week 14.(Tuesday)
- Show your working steps.

Name:

ID number:

Date:

Answer all question (40%)

1. **MAXIMUM AND MINIMUM VALUE**

   a) Sketch the graph of $g(x)=x^2-4x$ and identify all the relative extreme and absolute extreme of the function on the intervals $(-1,5]$ (4 marks)

   b) Sketch the graph of $h(x)=-(x+4)^3$ and identify all the relative extreme and absolute extreme of the function on each of the following intervals. (4 marks)

      i. $(-\infty,\infty)$ (4 marks)
      ii. $[-5.5,-2]$

   c) Let $f(x) = 2x^3 - 9x^2 + 12x - 3$, are there any extreme values? First, are there any critical values solution to $f'(x) = 0$ and do there determine a maximum or a minimum? And what are the coordinates on the graph of that maximum and minimum? where are the turning points? (5 marks)

   d) Let $f(x) = x^2 - 6x + 5$, are there any critical values or any turning point? If so, determine a maximum or a minimum? And what are the coordinate on the graph of that maximum or minimum? (4 marks)

2. **OPTIMIZATION**

   a) A cone is made from a circular sheet of radius, " R ", by cutting out a sector and gluing the cut edges of the remaining piece together. What is the maximum attainable volume for the cone? (8 marks)

   b) Let x and y be two positive numbers such that $x+2y=50$ and $(x+1)(y+2)$ is a maximum. (8 marks)

   c) We want to build a box whose base length is 6 times the base width and the box will enclose 20 in^3. The cost of the material of the sides is RM3/in^2 and the cost of the top and bottom is RM15/in^2. Determine the dimensions of the box that will minimize the cost. (8 marks)

3. **PARTIAL DERIVATIVES**

   a) Calculate $\frac{df}{dx}$ and $\frac{df}{dy}$ for the following functions by holding the opposite variable constant then difference: (8 marks)

      i. $f(x,y) = x^2 - 3xy + 2y^2 - 4x + 5y - 12$

      ii. $f(x,y) = \sin(x^2y - 2x + 4)$

   b) Calculate the three partial derivatives of the following functions.

i. $f(x,y,z) = x^2y - 4xz + \frac{y^2}{x-3yz}$ (8 marks)

ii. $g(x,y,z) = \sin(x^2y - z) + \cos(x^2 - yz)$

4. **AREA BETWEEN THE CURVES**

a) Find the area between $f(x) = -x^2 + 4x + 3$ and the above $g(x) = -x^3 + 7x^2 + 10x + 5$ over the interval $1 \leq x \geq 2$. (3 marks)

b) Find the area between $f(x) = -x^2 + 4x$ and the above $g(x) = x^2 - 6x + 5$ over the interval $0 \leq x \geq 1$. (3 marks)

5. **APPLICATION OF INTEGRATION VOLUMES BY CYLINDRICAL**

a) Find the volume of the solid obtained by rotating the region bounded by $y = 2x^2 \; and \; y = x^3$ around the line $x = -1$ (4 marks)

b) The area under $y = x^2 + 1$ from x = 0 to x = 1 is revolved about the y-axis. Find the volume generated. (4 marks)

c) The area under $y = x$ from $x = 0$ to $x = 1$ is revolved about the y-axis. Find the volume of the solid generated using cylindrical shells. (4 marks)

6. **PROBABILITY**

a) Some fresh oranges and 33 damaged oranges are placed in a box. If oranges are selected at random from the box and the probability of getting a damaged orange is 3/7, find the number of fresh oranges in the box. (3 marks)

b) A closet consists of 6 adult clothes and a few children's clothes. A shirt is randomly selected from the closet. The probability that a child's shirt is selected is 8/11. Find the number of clothes in the closet. (3 marks)

c) In a bag, there are 12 balls consisting of 7 green balls and 5 yellow balls. Two balls are randomly selected one at a time from the basket without return. Calculate the probability of the combination of the first green ball and the second yellow ball. (3 marks)