Bago University

Department of Mathematics

First Semester Examination, March 2019

Second Year (B.Sc) **Math 2001**

(Physics Specialization) **Mathematics I**

Time Allowed: (3) hours

Answer All Questions.

1.(a) Find the ratio in which the line joining the point (2, 4, 5), (3, 5, – 4) is divided by the *YZ*- plane.

(b) Find the direction cosines of a line which is perpendicular to the lines whose direction ratios are 1, 2, 3 ; – 1, 3, 5.

2.(a) Show that the four points (– 6, 3, 2), (3, – 2, 4), (5, 7, 3) and (– 13, 17, – 1) are coplanar.

(b) Obtain the equation of the plane through the intersection of the planes $x + 2y + 3z + 4 = 0$ and $4x + 3y + 2z + 1 = 0$ and the origin.

3.(a) Determine a unit vector perpendicular to the plane of $\underline{A} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ and $\underline{B} = 4\hat{i} + 3\hat{j} - \hat{k}$.

(b) If $z = \tan^{-1}\left(\frac{x}{y}\right)$, $x = u\cos v$, $y = u\sin v; (u, v) = \left(1.3, \frac{\pi}{6}\right)$, then

(i) express $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ as functions of u and v both by using the Chain Rule and by expressing z directly in terms of u and v before differentiating. Then

(ii) evaluate $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ at the given point (u, v).

4.(a) Show that the function $f(x, y) = e^{-2y}\cos 2x$ satisfies a Laplace equation.

(b) Find the area of the region R enclosed by the parabola $y = x^2$ and the line $y = x + 2$.

P.T.O

5.(a) Evaluate the integral $\int_1^e \int_1^{e^2} \int_1^{e^3} \frac{1}{xyz}\,dx\,dy\,dz$.

(b) Table shows a frequency distribution of the weekly wages in dollars of 65 employees at the P and R Company. Construct a relative or percentage frequency distribution, a histogram, a relative frequency histogram, a frequency polygon and a relative frequency polygon.

Wages (dollars)	Number of Employees
\$ 50.00 – \$ 59.99	8
60.00 – 69.99	10
70.00 – 79.99	16
80.00 – 89.99	14
90.00 – 99.99	10
100.00 – 109.99	5
110.00 – 119.99	2

6.(a) (i) A student's final grades in Mathematics, Physics, English and Hygiene are respectively 82, 86, 90 and 70. If the respective credits received for these courses are 3, 5, 3 and 1, determine an appropriate average grade.

(ii) Prove that the sum of the deviations of $X_1, X_2, ..., X_N$ from their mean $\overline{X}$ is equal to zero.

(b) Find the mean deviation and the standard deviation of the set of numbers

9, 3, 8, 8, 9, 8, 9, 18.

****