CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

SUPPLEMENTARY

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF APPLIED COMPUTER SCIENCE

ACSC 271/ACMP 203: MATHEMATICAL METHODS FOR COMPUTER SCIENTISTS

STREAMS: BSC (COMP.SCI)   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 12/9/2018   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS:
- **Answer question ONE and Any other TWO   questions**
- **Adhere to the instructions on the answer booklet**

QUESTION ONE

a). Evaluate the angle between the two vectors,
$$a = i - 2j + 4k \quad and \quad b = -4i + j - 2k$$

[4 marks]

b). Find the area of the triangle PQR with vertices P =(3 4 7), Q =(0   6 1) and R = (5 -2 4)

[5 marks]

c). Verify whether the   vectors   a = (-1   2   2), b = (2   -3   1),   c =(-4 7 3) are coplanar

[5 marks]

d). Find the volume of the parallellopiped spanned by the vectors a = (1 3 -1), b = (-2 1   2),   c = (3   5 -2)

[5 marks]

c). Evaluate the following limits

(i)
$$\lim_{\delta x \to 1} \frac{x^2 - 1}{x - 1}$$

[3 marks]

(ii)
$$\lim_{\delta x \to \infty} \frac{x^2 - 4x}{4x^2 + 7}$$

[3 marks]

d). Given that $y = \sqrt{x + 3}$ evaluate $\frac{dy}{dx}$ [5 marks]

QUESTION TWO

a). Prove that the series $\sum_{n-1}^{\infty} (-1)^{n-1} \frac{3n!}{n^n}$ is absolutely convergent using the ratio test   [7 marks]

b). Prove that the series

$$\sum_{n-1}^{\infty} \frac{n^2}{(2n-1)!}$$

Is convergent using the root test

[7 marks]

c). Using an integrating factor solve the differential equation

$$\frac{dy}{dx} + 2x = \sin x$$

[6 marks]

QUESTION THREE

a). Calculate the determinant of the matrix below   [7 marks]

$$\begin{pmatrix} 1 & 3 & -2 \\ 4 & -5 & 6 \\ 0 & 0 & 2 \end{pmatrix}$$

b). Test the consistency of the system below   [5 marks]

$$-X_1 + 2X_2 + -3X_3 = 4$$
$$2X_1 - 4X_2 + 6X_3 = -8$$
$$X_1 - 2X_2 + 3X_3 = -4$$

c). Use the trapezoidal rule with n = 5 to approximate   [8 marks]

$$\int_1^2 \frac{dx}{x}$$