MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SECOND TERM EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONIC ENGINEERING

MECHANICAL ENGINEERING

MATHEMATICS II

DATE: 3/6/2021 **TIME: 8.30-11.30 AM**

INSTRUCTIONS:
Attempt all questions

1. a) Given the matrices A=$\begin{bmatrix} -1 & 2 \\ & -21 \\ & 34 \end{bmatrix}$ and B=$\begin{bmatrix} 1 & -2 & 3 \\ 6 & -1 & 2 \end{bmatrix}$

Determine $(AB)^T$ (6 marks)

b) Find the inverse of the matrix A=$\begin{bmatrix} 1 & 2 & 4 \\ 4 & 1 & 3 \\ 2 & 1 & 1 \end{bmatrix}$ (6 marks)

c) Three forces F_1,F_2 and F_3 acting at appoint in a mechanical system satisfy the simultaneous equations

$F_1+F_2+F_3=9$

$F_1-2F_2+2F_3=7$

$3F_1+F_2+F_3=15$

Use crammers rule to determine the values of forces (10 marks)

2. a) write down the sixth term in the binomial expansion of $(3x + 2y)^{10}$,and determine its value when $x = \frac{1}{2}$ and $y = \frac{1}{3}$ (5 marks)

b) i) show that $\sin 3\beta=3\sin\beta-4\sin^3\beta$

ii) By setting β=π/3 in (i) above, determine the value of sin(π/3) without using a calculator or tables. Leave surds in the answer. (9 marks)

3. Solve the equation

$sinx + sin3x + sin5x = 0$, for values of x between 0º and 180º inclusive (6 marks)

4 a) find the angle between the vectors

A=3i-2j+5k and B=4i-7j+8k (6 marks)

b) Determine the value of constant a if the three vectors (5 marks)

A=2i-j+ak,B=-2i-2j and C=4i+2j-3k are coplanar

5. a) solve the equation

$x + 5 - \frac{1}{x+4} = 1$ (6 marks)

b) Given that u=2xy-x^2+y^2, show that $\frac{d\ ^2u}{dx^2} + \frac{d^2u}{dy^2} = 0$. (5 marks)

6 a) solve by factorization $8x^2 + 9x + 1 = 0$ (6 marks)

b) By completing the square, determine the constants p,q and r such that

$4x^2 + 7x + 6 = p(x + q)^2 + r$ (5 marks)

7. a) perform the following integration

$\int(x - 11 + 3/\sqrt{x})dx$ (5 marks)

b) Let $y = (x + 1)(x^2 + 3). find\ dy/dx$ (6 marks)