TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING
DME 315 Y2S1

AMA 2250
ENGINEERING MATHEMATICS III

END SEMESTER EXAMINATION
SERIES: DECEMBER 2015
TIME: 2 HOURS

INSTRUCTIONS
You should have the following for this exmination

- Answer booklet
- Scientific calculator
- Mathematic table

This paper consists of ***FIVE*** questions
Answer Question **ONE (compulsory)** and any other **TWO** questions
The paper consists of **3 PRINTED** pages

Question1

(a) Solve the following simultaneous equations using cofactors
$x + y + z = 3$
$x - 2y + 3z = 4$
$4y + x + 9z = 6$

(10 marks)

(b) Given that $A = 2i - j + k$, $B = i - 2j - 5k$ and $C = 3i - 4j - 4k$ show that AB and C forms the sides of a right angled triangle

(10 marks)

(c) i) convert the complex number $(\frac{2+i}{3-i})^2$ into polar form
ii) convert $12 < -60^o$ to rectangular form

(10 marks)

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Question2

(a) Vector $p = 2i + 2j - k$ and $q = 6i - 3j + 2k$, determine
i) pxq
ii) a unit vector perpendicular to both p and q
iii) angle between the two vectors

(10 marks)

(b) Determine the Eigen values and the corresponding Eigen vectors for the Matrix

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

(10 marks)

Question3

(a) Express the roots of $(-14 + j3)^{-2/5}$ in polar form

(10 marks)

(b) Use cramers rule to solve the following simultaneous equation
$3x + y + 2z = 3$
$2x - 3y - z = -3$
$x + 2y + z = 4$

(10 marks)

Question4

(a) i) Express $\frac{1+2i}{1-3i}$in the form $r(\cos\theta + i\sin\theta$

ii) Determine the modulus and argument of the complex number $Z = 2 + 3j$mexpressingit in polar form

(10 marks)

(b) Given that $A = x^2yzi + xyzj + y^2zk$ and $B = xy^2 - 2y^2 + x^2z^2$

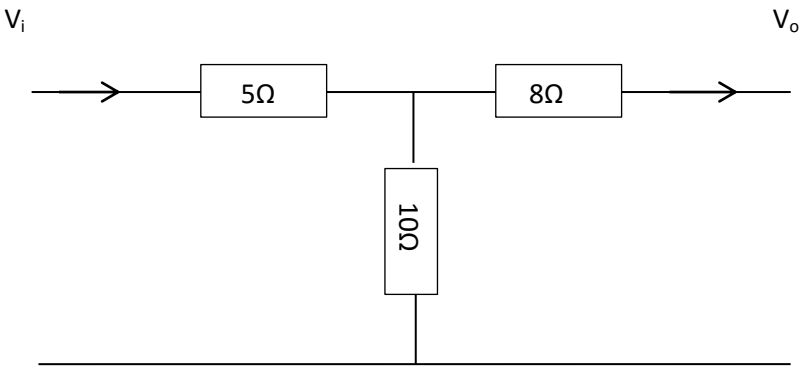
i) prove that div curl A = curl grad B

ii) determine div grad B at 1,1,1

(10 marks)

Question5

(a) A four terminal network is made of parallel-series impedances of 5Ω, 10Ω and 8Ω respectively as shown below. If the input voltage $V_i = 25\Omega$ and input current 2A, determine the output voltage and current using the resultant impedance transfer



(10 marks)

(b) Prove that $\nabla^2\frac{1}{|r|} = 0$

(10 marks)