MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SECOND YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

ECU 00201: MATHEMATICS IV

DATE: 30/4/2019 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS:

Answer question ONE and any other TWO questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Use the compound angle formulae to simplify the following

i) $sin\left(\theta + \frac{\pi}{2}\right)$ (3 marks)

ii) $cos(180 - \theta)$ (3 marks)

b) Given that $8cos\theta + 25sin\theta = Rcos(\theta - \alpha)$

i) Find the value of R and α (4 marks)

ii) hence solve the equation $8cos\theta + 25sin\theta = 17$

For $0^0 \leq x \leq 360^0$ (4 marks)

c) Show that

i) $\frac{1}{\cos A + \sin A} + \frac{1}{COS\,A - SIN\,A} = Tan2A\ Cosec\ A$ (5 marks)

ii) Given the vectors $a = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $b = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$

Find

i) $|a - b|$ (3 marks)

ii) $3a - 5b$ (3 marks)

e) Kanu bought 8 pencils and 5 rulers at a total cost of Ksh 271 from a bookshop, Deno bought 14 pencils and 21 rulers from the same bookshop at a total cost of Ksh 707 determine the cost of each item

(5 marks)

QUESTION TWO (20 MARKS)

a) Using the expansion of $tan(A+B)$ show that

$tan3\theta = \frac{3tan\theta - tan^2\theta}{1-3tan^2\theta}$ (5 marks)

Hence solve the equation$tan3\theta + 2tan\theta = 0$ for$0^0 and\ 180^0$ inclusive

(5 marks)

b) Solve the triangle PQR given PQ=5.9cm QR=9.2cm and

$Angle\ Q = 107^0$ (4 marks)

c) Prove the identity

$\frac{\sin 2x - cos2x + 1}{\sin 2x + cos2x + 1} = tanx$ (6 marks)

QUESTION THREE (20 MARKS)

a) If $Sin\ A = \frac{12}{25}\ \ and\ cosB = \frac{4}{5}$ where A and B are acute angles determine

i) $cos(A+B)$ (5 marks)

ii) $\tan 2B$ (5 marks)

b) Show that

$sihn^{-1}x = in\{x + \sqrt{x^2} + 1$ and hence determine $sinh^{-1}(0.84)$ correct to four decimal places (10 marks)

QUESTION FOUR (20 MARKS)

a) Find the value of $\tan A\ \ when\ \tan(A - 45^0) = \frac{1}{3}$ (5 marks)

b) Express $5sin2\theta + 8cos2\theta$ in the form of $Rsin(2\theta + \alpha)$ Hence solve

$5sin2\theta + 8cos2\theta = 9$ for $0^0 \leq \theta \leq 360^0$ (8 marks)

c) Wagi deposited Ksh 14237 in a bank offering a compound interest of 8% per annum

Calculate

i) Total savings after 11years (4 marks)

ii) Time taken for the interest to amount to Ksh 10,140 (3 marks)

QUESTION FIVE (20 MARKS)

a) Show that

$$\frac{sin\theta}{1+cos\theta} + \frac{1+cos\theta}{sin\theta} = \frac{2}{sin\theta}$$ (5 marks)

b) A worker is paid Ksh 25000 as the starting salary with an annual increment of 2% per annum

Calculate

i) His salary at the end of his 10year (5 marks)
ii) His total earnings after 30years of service
iii) Number of Years it would take for him to attain a salary of ksh 100000.

(5 marks)

c) Solve for $-180^0 \leq \theta \leq 180^0$ the equation $6sin2\theta - 4cos2\theta = 1$ (5 marks)