MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

CERTIFICATE IN ELECTRICAL ENGINEERING

CERTIFICATE IN MECHANICAL ENGINEERING

CERTIFICATE IN CIVIL ENGINEERING

ECU 00201: MATHEMATICS IV

DATE 23/9/2019   **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS
ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a)   Use the compound angle formulae to simplify the following

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

   ii) $cos(180 - \theta)$ (6 marks)

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

   i) Find the value of R and α

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

            For $0^0 \leq x \leq 360^0$ (8 marks)

c)   Show that

   i) $\frac{1}{cos A + sin A} + \frac{1}{COS A - SIN A} = Tan2ACosec\ A$ (5 marks)

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

Find

  i) $|a - b|$

  ii) $3a - 5b$ (6 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) i)   Using the expansion of $tan(A + B)$ show that

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

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

                        (5 marks)

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

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

b) Prove the identity

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

QUESTION THREE (20 MARKS)

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

  i) $cos(A + B)$

  ii) $tan 2B$ (8 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   (12 marks)

QUESTION FOUR (20 MARKS)

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

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

$5\sin2\theta + 8\cos2\theta = 9$ for $0^0 \leq \theta \leq 360^0$ (10 marks)

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

Calculate

i)   Total savings after 11years

ii)   Time taken for the interest to amount to Ksh 10,140 (5 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
ii)   His total earnings after 30years of service

        number of Years it would take for him to attain a salary of ksh 100000.

(10 marks)

c) Solve the equation $3\cosh x + 2sihn\ x = 14.31$ correct to four decimal places (5 marks)

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