MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

BACHELOR OF SCIENCE IN BUILDING AND CIVIL ENGINEERING

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

ECU 105: ENGINEERING MATHEMATICS II

DATE: 31/8/2017 **TIME: 2:00 – 4:00 PM**

INSTRUCTIONS: Answer Question ONE and any other TWO questions

1**. This question paper has FIVE questions**

2. Answer question ONE and any other TWO questions

QUESTION ONE (30 Marks)

a) A committee of 6 people is to be selected from 4 women and 7 men. In how may ways:

i) Can the committee be selected? (2 marks)

ii) Can the committee be selected if three men must be in the committee? (3 marks)

b.) Solve for x, $3^{2x} - 1 = 0.07$ (5 marks)

c.) If $\log_3(2x + 3) = log_3 4 + 3$ solve for x (5 marks)

d.) The first term of a G.P. is 5, and the common ratio is -3, which term is equal to -135) (5 mark)

e.) Simplify $\frac{1}{\sqrt{x^2 - a^2}}$ when $x = a\ cosec\theta$ (5 marks)

f.) Solve the equation $1 + cos\theta = 2sin^2\theta$, for the values of θ from 0° to 360° (5 marks)

g.) Sketch the graph of $y = 3\sin 2(x - \frac{\pi}{4})$ $for\ 0 \leq x \leq 2\pi$. Find its wavelength and amplitude (5 marks)

QUESTION TWO (20 MARKS)

a) Differentiate $f(t) = \frac{e^t}{sint}$ (3 marks)

Simplify $\frac{16!}{9!7!} + \frac{16!}{10!6!} + \frac{16!}{11!5!}$ (3 marks)

b) Determine the value of x for which the following form an AP.

$8 - 6x, 2x^2 - 2, 18x - 20$ (3 marks)

c) Rationalize the denominator of the following surd $\frac{1}{\sqrt{5+2\sqrt{6}}}$ (3 marks)

d) How many possible sets of 12 glass pearls can be formed if there are 5 possible colors ? (3 marks)

e) Find all complex cube roots of $27i$ (5 marks)

QUESTION THREE

a) Solve the equation $2^{2x+3} + 2^{x+3} = 1 + 2^x$ (4 marks)

b) Show using the modulus-argument representation that $\boldsymbol{z\bar{z}}$ is real (6 marks)

c) A 3 hour river cruise goes 15 km upstream and then back again. The river has a current of 2 km a in hour. What is the boat's speed and how long was the upstream journey? (10 marks)

QUESTION FOUR

a) A phone company charges \$50 a month and 2 cents a minute for each minute used over 400 minutes Angela's cell phone bill is \$54.92. How many minutes did she use? (3 marks)

b) Given that $log_{10}4 + 2\ log_{10}p = 2$, calculate the value of p without using tables or calculator(4 marks)

c) Prove that $\frac{1}{1-sinx} - \frac{1}{1+sinx} = 2tanxsecx$ (6 marks)

d) The line joining the top of a hill to the foot of the hill makes an angle of 30^o with the horizontal through the foot of the hill.There is one temple at the top of the hill and a guest house half away from the foot to the hill. The top of the temple and top of the guesthouse both make an elevation of 32^o at the foot of the hill. If the guest house is 1 km away from the foot of the hill along the hill, find the heights of the guest house and the temple. (7 marks)

QUESTION FIVE

a) Without using tables, evaluate $log_{10}\frac{41}{35} + log_{10}70 - log_{10}\frac{41}{2} + 2log_{10}5$ (5 marks)

b) Let $z = 1 - i$ find z^{10} (7 marks)

c) Prove that $cos5\theta = 16cos^5\theta - 20cos^5\theta + 5cos\theta$ (8 marks)