



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN
ELECTRICAL AND ELECTRONIC S ENGINEERING

SUPPLEMENTARY EXAMINATION

SMA 109 ALGEBRA

DATE: 30/8/2017

TIME: 8:30 – 10:30 PM

INSTRUCTIONS

Answer question ONE (Compulsory) and any other TWO questions

QUESTION ONE (COMPULSORY)

a) Solve the simultaneous equations below:-

i) $3x + 5y + 4 = 0$ and $2x + 6y = 8$

ii) $5a + b + 3c - 2 = 0$

$$2a + 5b + 7c = 3$$

$$3a - 2b - 10c = 17 \quad (12 \text{ marks})$$

b) Solve for x given that

i) $\log_2 (x^2 - 8x + 1) = 0$

ii) $\frac{3}{x-2} + \frac{5}{x-3} = \frac{6}{x-3} \quad (8 \text{ marks})$

c) i) Evaluate $\frac{4 \times 6! - 12 \times 5!}{}$

$$3 \times 5 !$$

- ii) Simplify : $\frac{6t^2 + 19at + 15a^2}{9t^2 - 25a^2}$ (7 marks)
- d) Divide $x^3 - 5x^2 - 2x - 3$ by $(x - 1)$ (3 marks)

QUESTION TWO (20 MARKS)

- a) The length of a rectangle exceeds its breadth by 4cm. if the length were halved and the breadth increased by 5cm, the area would be decreased by 35cm², find the dimensions of the original rectangle. (7 marks)
- b) The first term of an A.P is – 12 and the last term is 40. If the sum of the progression is 196, find the number of terms and the common difference.(8 marks)
- c) Find the coefficient of x^{10} in the expansion of $(2x - 3)^{14}$ (5 marks)

QUESTION THREE (20 MARKS)

- a) Solve the following equations
- i) $e^{2x} - 2e^x = 15$
- ii) $2x^3 + x^2 - 13x + 6 = 0$
- iii) $\frac{3}{r} - \frac{4}{s} = \frac{5}{6}$ and $\frac{1}{r} + \frac{3}{s} = 1$ (15 marks)
- b) Determine the polar form of the complex number $4 + j6$ (5 marks)

QUESTION FOUR (20 MARKS)

- a) Simplify: i) $\frac{n!}{(n-3)! 3!}$ ii) $(3x^2y^3)^2 \times (27y^3x^6)^{1/3}$ (5 marks)
- b) Express with a real denominator $\frac{j3-2}{1+j2}$ (3 marks)
- c) Three consecutive terms of a G.P are $x - 2$, x , $x + 3$. Find x and the term after $x + 3$. (6 marks)
- d) Write down the middle term of the expansion $(3x + 2y)^{10}$ in ascending powers of x ; and evaluate the term when $x = \frac{1}{2}$ and $y = \frac{1}{3}$ (6 marks)

QUESTION FIVE (20 MARKS)

- a) A boy wishes to build up a triangular pile of toy bricks so as to have one brick in the top row, two in the second, and three in the third and so on. If the boy has 100 bricks, how many complete rows did he make and how many bricks has he left. (7 marks)
- b) i) Simplify $\frac{\cos 5x + j\sin 5x}{(\cos x - \sin x)^3}$
- ii) Evaluate: ${}^{10}C_2$
- iii) In how many arrangements can be made with the letters of the word NOTATION (7 marks)
- c) i) Proof that ${}^{n+1}C_1 - {}^nC_1 = 1$
- ii) Find x, given that $\log 4 + 2 \log x = 2$ (6 marks)