THE KENYA POLYTECHNIC

GRAPHIC ARTS DEPARTMENT
DIPLOMA IN PRINTING TECHNOLOGY
DIPLOMA IN GRAPHIC DESIGN
END OF YEAR I EXAMINATIONS
NOVEMBER 2006
MATHEMATICS
3 HOURS

INSTRUCTIONS TO CANDIDATES:

Answer any FIVE questions.

All questions carry equal marks and the maximum marks for each part of a question are as shown.

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1. Convert the following to base ten:

   (a) $11110010011101 \cdot 1111_2$ (b) $3576 \cdot 767_8$

   (c) $X87X \cdot 977_{12}$ (d) $AEFD.9EB_{16}$ (20 marks)

2. Convert the base ten number 4784_{10} into:

   (a) Binary (b) Octal

   (c) Duodecimal (d) Hexadecimal (20 marks)

3. Solve the following equations:

   (a) $x^3 - 5x^2 - 2x + 24 = 0$ (6 marks)

   (b) $x^3 - 6x^2 - 7x + 60 = 0$ (6 marks)

   (c) $x^3 - 4x^2 + x + 6 = 0$ (6 marks)

   (d) $x^2 - 7x + 12 = 0$ (2 marks)

4. (a) Solve the following:

   (i) $12^{2x} = 35.4$ (4 marks)

   (ii) $4^{3x-2} = 26^{(x+1)}$ (6 marks)

(b) Solve the simultaneous equations:

$$5x - 3y - 2z = 31$$
$$2x + 6y + 3z = 4$$
$$4x + 2y - z = 30$$

(10 marks)

5. (a) The 13th term of an AP is 27 and the 7th term is three times the 2nd term. Determine the first term, the common difference and the sum of the first ten terms. (10 marks)

(b) In a G.P the sum of the second and third term is 6 and the sum of the 3rd and 4th term is 12. Determine the first term, the common ratio and the sum of the first ten terms. (10 marks)

6. Evaluate the following:

(a) $\dfrac{6^{\frac{1}{2}} \times 96^{\frac{1}{4}}}{(216)^{\frac{1}{4}}}$ (b) $\dfrac{6^{\frac{1}{2}} \times 2^{\frac{5}{4}} \times 3^{\frac{1}{4}}}{6^{\frac{3}{4}}}$

(c) $\dfrac{12^{\frac{1}{3}} \times 6^{\frac{1}{3}}}{(81)^{\frac{1}{6}}}$ (d) $\dfrac{8^{\frac{1}{6}} \times 4^{\frac{1}{3}}}{(32)^{\frac{1}{6}} \times (16)^{\frac{1}{12}}}$

(e) $\left(2\frac{7}{9}\right)^{\frac{-3}{2}}$ (20 marks)

7. (a) Given $n = \dfrac{IR}{E - Ir}$, make I the subject. (4 marks)

(b) Transpose the formula $\dfrac{R}{r} = \sqrt{\dfrac{f+P}{f-P}}$ to make f the subject of the formula.

(4 marks)

(c) Make R the subject of the formula $V = \dfrac{\pi h(3R^2 + h^2)}{6}$. (4 marks)

(d) Derive the quadratic formula given $ax^2 + bx + c = 0$ and hence or otherwise, solve the equation $2x^2 + 9x + 4 = 0$. (8 marks)