TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN MECHANICAL ENGINEERING (DMEN 5)

AMA 2350: ENGINEERIGN MATHEMATICS V

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

Question One (Compulsory)

a) Solve for x if:

$$3\log_2 x = \frac{1}{27}$$

(i) **(2 marks)**

$$3^{2x+1} = \left(\frac{1}{81}\right)^{2-x}$$

(ii) **(2 marks)**

$$3^{2x} - 9^{(x-1/2)} = 6$$

(iii) **(4 marks)**

b) Use Matrix method to solve the following simultaneous equations:

$$3x + 2y = 12$$
$$4x - 2y = 5$$

(6 marks)

c) (i) In an arithmetic progression, the first term is 6, fifth term is 202 and the last term is 447. Determine the sum of the terms in the progression. **(5 marks)**

(ii) In a geometric progression, the second term is 6 and the fifth term, is 162. Determine the sum of first ten terms of the progression. **(5 marks)**

d) Table 1 shows the data of marks of twenty students in a class:

Table 1

Marks (x)	3	4	5	6	8	9	10	11	13
Frequency (f)	2	1	5	3	3	2	1	1	2

Determine:

(i) The mean mark

(ii) The standard deviation **(6 marks)**

Question Two

a) Determine the lowest common multiple (LCM) of 2940 and 3150 **(3 marks)**

b) Simplify the following:

$$\frac{6}{3x+3y} - \frac{x}{x^2 - xy}$$

(i) **(8 marks)**

$$\frac{r/4}{7/8 - r/2}$$

(ii)

(2 marks)

$$\frac{a^{1/2}b^{-1/2} - a^{-1/2}b^{1/2}}{a^{-1/2}b^{-1/2}}$$

(iii) **(4 marks)**

$$\frac{a}{2x-3} + \frac{b}{3x+4} = \frac{x+7}{(2x-3)(3x+4)}$$

c) If determine the values of a and b **(5 marks)**

$$\frac{3}{3+2\sqrt{3}}$$

d) Rationalize **(3 marks)**

Question Three

a) Evaluate without using tables the following:

(i) $\sqrt[5]{125} \times 5^{1.4}$ **(2 marks)**

(ii) $\frac{12^{3/2} \times 16^{1/8}}{27^{1/6} \times 8^{1/2}}$ **(3 marks)**

(iii) $\log_6 81 \times \log_9 216$ **(3 marks)**

b) (i) Given $\log_2 3 = p$, express $\log_{27} 32$ in terms of P. **(3 marks)**

(ii) If $P = \log_{10}^{12}$ and $q = \log_{10}^{3}$, express $\log_{10}\sqrt{3/4}$ in terms of p and q **(3 marks)**

c) Simplify the following:

(i) $\frac{(x+1)^{-3/2} + (x+1)^{-1/2}}{(x+1)^{-1/2}}$ **(4 marks)**

(ii) $\frac{x^{p+\frac{1}{2}q} \cdot y^{2p+q}}{(xy^2)p \cdot \sqrt{x^q}}$ **(2 marks)**

Question Four

a) (i) In a geometric progression, the first term is 10 and the sixth terms is 320. Determine the sum of the first six terms of the progression. **(4 marks)**

(ii) The sum of the first ten terms of an arithmetic progression and the tenth term of the progression both are – 5/2. Determine the first term and the common difference of the progression.**(6 marks)**

b) Table 2 shows the marks scored in a practical test by a group of students.

Table 2

Mark	10	10.5	11	11.5	12	12.5	13
Frequency	4	8	14	22	19	10	3

Using an assumed mean of 11.5 and a class width of 0.5 calculate:

(i) The mean mark

(ii) The standard deviation **(10 marks)**

Question Five

a) (i) Table 3 shows soccer match results for teams A, B, C and D in a league match.

Table 3

Team	Wins	Draws	Losses
A	15	1	3
B	13	6	0
C	8	6	5
	13	3	3

For a win teams scores 3 points a draw 1 point ad a loss no point. By forming matrices, determine the total score for each team **(4 marks)**

(ii) Joy bought 5 oranges, 4 apples and 10 bananas while Margaret bought 6 oranges, 2 apples and 15 bananas. If the prices of an orange, apple and banana were sh 5, 2 and 3 respectively, form matrices from the information and determine the total expenditure of each. **(4 marks)**

b) Table 4 shows distribution of time taken by employees of a firm to do a particular job.

Time (min)	50-60	60-70	70-80	80-90	90-100	100-110	110-120
Frequency	8	10	16	14	10	5	2

Determine:

(i) The median

(ii) Interquartile range

(iii) Third decile

(iv) 35^{th} Percentile **(12 marks)**