



1ST SEM. 2006/2007

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER

PROGRAMME: ALL FIRST YEARS

COURSE CODE: AEM 101

TITLE OF PAPER: MATHEMATICS

TIME ALLOWED: TWO (2) HOURS

**INSTRUCTION: 1. ANSWER ALL QUESTIONS IN SECTION I
AND ANY THREE QUESTIONS IN
SECTION II**

2. SHOW ALL WORKINGS

**DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY
THE CHIEF INVIGILATOR**

Candidate's Seat Number: _____

Candidate's Identity Number: _____

Candidate's Programme of Study: _____

Time and Date of Examination: _____

FOR EXAMINER'S USE ONLY

Section	Possible Marks	Internal Examiner	Signature	External Examiner	Signature
I	40				
II	60				
Total	100				

SECTION I: Answer all questions in this section

Part 1: Multiple Choice: For each item, circle the one letter of the choice that best completes/answers that item. The space next to each question may be used to work out the question before making a choice.

1. An article was sold for E60, which was a loss on the cost price of 10%. The cost price was therefore:

- (a) E54.00
- (b) E66.00
- (c) E66.67
- (d) E70.50
- (e) Not given, answer is: _____ (3 marks)

2. A car travels 540 km at an average speed of 30 km/h. On the return journey, the average speed doubles to 60 km/h. the average speed over the entire journey is:

- (a) 45 km/h
- (b) 42 km/h
- (c) 40 km/h
- (d) 35 km/h

Not given, answer is: _____ (3 marks)

3. $\frac{a^2 - a}{a - 1}$ is equal to:

- (a) a
- (b) $a^2 - 1$
- (c) a^2
- (d) $1 - a^2$
- (e) Not given, answer is: _____ (2 marks)

4. The L.C.M of a^4b^3 , ab^2c^4 and ab^3c^2 is:

- (a) abc
- (b) ab^2
- (c) $a^4b^3c^4$
- (d) $a^6b^8c^7$
- (e) Not given, answer is: _____ (2 marks)

5. $t - \frac{3-t}{2} + \frac{3+t}{2}$ is equal to:

- (a) t
- (b) 2t
- (c) 3+2t
- (d) 4t
- (e) Not given, answer is: _____ (3 marks)

If $T = 2\pi \sqrt{\frac{R-H}{g}}$ then R is equal to:

(2 marks)

$$\frac{T^2}{2\pi} + \frac{H}{g}$$

$$\frac{gT^2}{2\pi} + H$$

$$\frac{T^2 + 2\pi H}{2\pi}$$

$$\frac{gT^2}{4\pi^2} + H$$

A motorist travels x km at 50km/h and y km at 60 km/h. The total time taken is 5 hrs. If his average speed is 50 km/h, then:

(3 marks)

$$50x + 60y = 5$$

$$x + y = 280$$

$$6x + 5y = 1500$$

$$x + y = 280$$

$$\frac{x}{50} + \frac{y}{60} = 5$$

$$\frac{x+y}{5} = 5$$

$$50x + 60y = 5$$

$$x + y = 25$$

$\sqrt{9p^2} + \frac{1}{2}p^2$ is equal to:

- (a) 6
- (b) 3
- (c) $6p^4$
- (d) $3p^4$
- (e) Not given, answer is: _____

(2 marks)

9. If $y = 5 \times \sqrt[3]{x^2}$ then $\frac{dy}{dx}$ is equal to:

(2 marks)

(a) $\frac{15\sqrt{x}}{2}$

(b) $\frac{15}{2\sqrt{x}}$

(c) $\frac{10}{3 \times \sqrt[3]{x}}$

(d) $\frac{10 \times \sqrt[3]{x}}{3}$

10. $\int \frac{1}{\sqrt{x}} dx$ is equal to:

(2 marks)

(a) $\frac{1}{2\sqrt{x}} + c$

(b) $\frac{1}{2\sqrt{x}}$

(c) $2\sqrt{x} + c$

(d) $2\sqrt{x}$

IN QUESTIONS 11 – 13. COMPLETE THE BRACKETS, WHICH HAVE BEEN LEFT BLANK;

11. $x^2 - y^2 + 3x + 3y = (x + y) (\quad)$

(2 marks)

12. $x^2 - 25y^2 = (\quad) (\quad)$

(2 marks)

3. $x^2 + 2xy + y^2 = (\quad)^2$ (2 marks)

4. The mode of the set of numbers: 1,3,3,5,7,8,9,9,9 is:

- (a) 7
 - (b) 6
 - (c) 9
 - (d) 5
- (2 marks)

5. The median of 3,4,4,4,5,6,8,8,8,8 is:

- (a) 5.5
 - (b) 8
 - (c) 4
 - (d) 5.8
- (2 marks)

6. If $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ then A^{-1} is equal to: (2 marks)

a) $\begin{pmatrix} \frac{1}{a} & \frac{1}{b} \\ \frac{1}{c} & \frac{1}{d} \end{pmatrix}$

b) $\begin{vmatrix} c & d \\ a & b \end{vmatrix}$

c) $\frac{1}{ad-bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

d) $\frac{1}{ad-bc} \begin{pmatrix} b & -d \\ -a & c \end{pmatrix}$

17. Packets of chemicals were weighed and the following results were obtained:

Weight (kg)	1.2	1.4	1.3	1.6	1.33	1.45	1.25	1.55	1.15
Frequency	1	6	25	72	93	69	27	6	1

Find the mean weight of the packets

(4 marks)

SECTION II: ANSWER ANY THREE QUESTIONS**Show all of your work: Answer each question in the space provided.****All Questions in this section carry equal marks (20 marks)****Question 1**

- (a) X, Y and Z share a sum of money in the ratio 7: 8: 16. If Z receives 27 pounds more than X. How much was shared?

(10 marks)

- (b) Given that $y = 60x + 3x^2 - 4x^3$, calculate the gradient of tangent to the curve at the point where $x = 1$

(5 marks)

- (c) The curve $y = 2x^2 - \frac{k}{x}$ has a gradient of 5 when $x = 2$. Calculate the value of k . (5 marks)

Question 2

- (a) Simplify the fractional expression: (10 marks)

$$\frac{7}{x^2 + 3x - 10} - \frac{2}{x^2 + 5x} - \frac{2}{x^2 - 2x}$$

b) Factorise $9x^2 - 3x - 12$ and solve the equation $9x^2 - 3x - 12 = 0$

(5 marks)

(c) Find three consecutive numbers so that their sum is 48.

(5 marks)

Question 3

(a) In a school, three classes took the same examination. Class A contained 30 pupils and their average mark was 76. Class B contained 28 pupils and their average mark was 74. Class C had an average mark of 70. The average obtained by all pupils together was 72. How many pupils were in class C? **(10 points)**

(b) 500 tickets were sold for a concert. Some at E20.00 each and the remainder at E12.50 each. The money received for the dearer tickets was E3500.00 more than for the cheaper tickets. Find the number of dearer tickets which were sold. **(5 marks)**

(c) $A = 16 - 3x + \frac{x^2}{4}$

If $A = 9$, calculate the value of x

(5 marks)

Question 4

Integrate the following functions:

(i) $\int_1^4 3\sqrt{x} dx$

(4 marks)

(ii) $\int_6^1 (x^2 - 2) dx$

(4 marks)

(iii) $\int (2x - 3)^2 dx$

(4 marks)

(b) Differentiate the following:

(i) $y = x^3 + \frac{3}{\sqrt{x}}$

(4 marks)

(ii) $y = \frac{x^3}{2} - \frac{5}{x} + 3$

(4 marks)

Question 5

(a) Matrices A and B are given as follows;

(9 marks)

$$A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}; B = \begin{pmatrix} 3 & 1 \\ -2 & 1 \end{pmatrix}$$

- (i) Find AB;
- (ii) $A^2 - B$;
- (iii) BB^T

(b) Solve the following simultaneous equations using matrices:

(6 marks)

$$x + 3y = 7$$

$$2x - 2y = 6$$

(ii) Find the matrix 'x' such that $Ax = B$; where $A = \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 3 \\ 11 \end{pmatrix}$

(5 marks)

END OF EXAM