

TECHNICAL UNIVERSITY OF MOMBASA FACULTY OF APPLIED AND HEALTH SCIENCES DEPARTMENT OF MATHEMATICS & PHYSICS UNIVERSITY EXAMINATION FOR: INSTITUTION BASED

DIPLOMA IN MECHANICAL, ELECTRICAL, BUILDING AND CIVIL ENGINEERING YEAR II SEMESTER I

AMA 2250: ENGINEERING MATHEMATICS III

END OF SEMESTER EXAMINATION

SERIES: APRIL2017

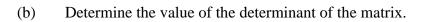
TIME:2HOURS

DATE: Pick DateApr 2017

Instructions to Candidates

You should have the following for this examination -Answer Booklet, examination pass and student IDMathematical table, calculator This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions. **Do not write on the question paper.**

Q.1	(a) Use the method of determinants to solve the following set of simultaneous equations:			
		11p + 7q + 2r = 31		
		$p + q + r = 4 \tag{12}$		
		$31p + 15q + 13r = 90 \tag{12 m}$	2 marks)	
	(b)	Use Maclaunn's theorem to obtain the power series for the function.		
		$f(x) = Cos^2 x$ upto the third term.	(6 marks)	
	(c)			
		(ii) Use the power series for $Cos(x+h)$ in $C(i)$ to obtain the value of $Cos46^{\circ}$ correct to four decimal places.	(6 marks)	
	(d)	Given $P = 2i + j - k$ and $q = i - j + k/2$ Determine (i) p.q (ii) pxq	(6 marks)	
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Q.2	(a)	Derive Maclauriu's Series.	(5 marks)	
	(b)	Determine the first five terms of series.		
		(i) $f(x) = Log_e(1+x)$		
		(ii) $f(x) = Cosx$	(10 marks)	
	(c)	Find the first four terms of the function.		
		$f(x) = (x-1)e^x$ near x=1		
		Using Tayolor series.	(5 marks)	
Q.3	(a)	Given A = $\begin{pmatrix} 1 & 3 & -1 \\ -2 & 2 & 4 \\ 3 & 1 & 3 \end{pmatrix}$ and B = $\begin{pmatrix} 2 & 3 & 1 \\ 3 & -1 & 1 \\ 3 & 2 & 0 \end{pmatrix}$ Obtain (i) A X B		
		$(ii) \qquad A + B$	(5 marks)	



$$A = \begin{pmatrix} 3 & -1 & 2 \\ 2 & 3 & 1 \\ 2 & 1 & 4 \end{pmatrix}$$
(3 marks)



 $12T_1 + 12T_2 + 12T_3 = 16.8$ $2T_1 + 4T_2 + 8T_3 = 4.8$ $8T_1 + 4T_2 = 8.0$

Use the inverse matrix method to determine the value of T_1 , T_2 and T_3 (12 marks)

Q.4 (a) A worker at a factory is stacking cylindrical-shaped pipes which are stacked in layers. Each layer contains one pipe less than the layer below it. There are 4 pipes in the top most layer. If there are n layers in total.

Determine the expression for total number of pipes stacked. (5 marks)

- (b) A business is expected to have a yearly profit of Kshs.275000 for the year 2016. The profit is expected to increase by 10% per year;
 - (i) Show that the difference between expected profit for the year 2020 and the expected profit in 2021 is Kshs.40300 to the nearest hundred shillings. (3 marks)
 - (ii) Find the total expected profits for the year 2016 to 2026 inclusive giving your answer to the nearest hundred shillings. (3 marks)
- (c) The sum of the first six terms of an arithmetic progression is 21, and the seventh term is three times the sum of the third and the fourth term.

Determine:	(i)	The first term	
	(ii)	The common ratio.	(5 marks)

- Q.5 (a) A canoe sails directly across a river at 4 m/s. The river flows at 2.4 m/s and is 720 metres wide.
 - (i) Determine the resultant velocity of the boat.
 - (ii) How far down stream is the canoe's landing point? (6 marks)
 - (b) Two anchors are holding a ship in place and their forces acting on the ship are represented by vectors A and B as follows:-

$$A = 3i + 5j - 2K \text{ and} B = 2i - 3j + 4k$$

If we are to replace the two anchors with a single anchor determine the vector representing the single vector. (2 marks)

- (c) If $\vec{a} = (2, 1, -3)$ and $\vec{b} = (-4, 4, -2)$ Obtain $\vec{a} \times \vec{b}$ (4 marks)
- (d) Determine the angle between the vectors P = 2i + 7K and Q = -2i + 2j + 4K.

(8 marks)