



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Engineering & Technology

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IN ELECTRICAL POWER ENGINEERING II

AMA 1151: ENGINEERING MATHS II

END OF SEMESTER EXAMINATIONS

SERIES: APRIL 2014

TIME: 2 HOURS

INSTRUCTIONS:

- This paper consists of **FIVE** questions.
- Answer question **ONE (Compulsory)** and any other **TWO** questions.

This paper consists of Three printed pages.

QUESTION 1 (Compulsory)

- a) Solve for θ such that $0 \leq \theta \leq 360^\circ$ and $2 \sin 2\theta + \sin \theta - 1 = 0$. (7 marks)
- b) Solve for θ given $0 \leq \theta \leq 180^\circ$ and $4 \sin 2\theta + 1 = 0$. (5 marks)
- c) Draw the graph of $y = 2x^3 + x^2 - 3x + 1$ from $x = -4$ to $x = 4$ use the graph to solve $-2x^3 - x^2 + 4x - 1 = 0$ (8 marks)

QUESTION 2

A right pyramid has a rectangular base ABCD with AB = 12cm and BC = 16 cm. Point M is the mid-point of Line AB and N is the mid-point of line BC. O is the center of the base and VO = 15 cm. calculate:

- i) The length of a slant edge
- ii) The angle between lines AV and VC
- iii) The angle between lines AB and BV.
- iv) The angle between the line VD and the base ABCD.
- v) The angle between the planes ABCD and VBC
- vi) The angle between the planes ABV and VDC.

(20 marks)

QUESTION 3

- a) Draw the graph of $y = 3 \cos(2\theta + 30)$ for values of θ from 0 to 180° taking the interval of 30° . (5 marks)
- b) Use your graph to solve
- i) $3 \cos(2\theta + 30) = -1$
 - ii) $\cos(2\theta + 30) = -\frac{2}{3}$ (3 marks)
- c) State the phase angle and wave length of $y = 3 \cos(2\theta + 30)$. (2 marks)
- d) Two planes A and B leave an airport simultaneously at 9.3-am. Plane A flies on the bearing of 070° from the airport at a speed of 400km/h and B flies on a bearing 290° at a speed of 450km/h. Calculate:
- i) Their distance apart after 3 hours correct to the nearest Km. (4 marks)
 - ii) The bearing of A from B after 3 hours correct to the nearest degree. (3 marks)
 - iii) After 3 hours B decides to head straight to the current position of A. What time will it get to this point correct to the nearest minute? (3 marks)

QUESTION 4

- a) Draw the graphs of $y = \sin 3x$ and $y = \cos (x + 30)$ on the same axis for $-180^\circ \leq x \leq 180^\circ$.
(6 marks)
- b) Use the graph to:
- Solve $\cos (x + 30)^\circ - \sin 3x = 0$
 - $3 \cos (x + 30)^\circ - 2 = 0$
(4 marks)
- c) Solve for θ , given $2 \sin^2 3\theta + 3 \cos 3\theta + 3 = 0$ and $0 \leq \theta \leq 360^\circ$
(10 marks)

QUESTION 5

- a) A frustrum is made by cutting a small pyramid of height 3cm from a pyramid of height 9cm. the slant height of the cut off pyramid is 5cm and the base is square. If the frustrum is open on both ends. Calculate its surface area.
(10 marks)
- b) i) Construct a table of values for the function $y = x^2 - x - 6$ for $-2 \leq x \leq 4$
(4 marks)
- ii) Draw the graph of the function $y = x^2 - x - 6$ for $-2 \leq x \leq 4$.
(4 marks)
- iii) By drawing a suitable line on the same grid, estimate the roots of the equation: $x^2 - 2x - 2 = 0$
(3 marks)