PAPER 1

TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

Department of Electrical & Electronics

UNIVERSITY EXAMINATION FOR:

Diploma in Electrical (Instrumentation and Control Engineering)

AMA 2151 MATHS II

END OF SEMESTER EXAMINATION

SERIES: December 2016

TIME: Two HOURS

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Instructions to Candidates

You should have the following for this examination
Answer Booklet, examination pass and student ID, Scientific Calculator & No Mobile Phone.
This paper consists of five questions. Attempt question one compulsory and any other two.
Maximum marks for each part of a question are as shown.
This paper consists of **THREE** printed pages

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

a) (i) Determine the derivative of
$y = 3x^2 + 7x$ from first principles (3 marks)

(ii) Find the gradient at the point (x_1y) on the point (x_1y) on the curve $x^2+y^3 = 3axy$ (3 marks)

(iii) Find the differential coefficient of $y = \tan x$ (4 marks)

(iv) Evaluate $\int x^4 \cos 5x^5 \, dx$ using substitution method (4 marks)

b) (i) Given $Z = \frac{1}{\sqrt{x^2 + y^2}}$ Find $\frac{dz}{dy}$ (4 marks)

(ii) Evaluate Sinh 1.275 (3 marks)

c) Determine
(i) $\int_0^2 (x^2 + 3x - 1) \, dx$ (2 marks)
(ii) $\int \cos (5x + 2) \, dx$ (2 marks)

d) Find the volume generated when plane figure bounded by $y = 5\cos 2x$, the x axis and ordinate at x=0 and $y = {}^{x}/_{4}$ rotates the x-axis through complete revolution (5 marks)

QUESTION TWO:

(a) (i) Find the co-ordinates of turning point of the curve
$y = \frac{2x^3}{3} - 5x2 + 12x - 7$ (5 marks)

(ii) Distinguish whether its maximum or minimum (3 marks)

(iii) Use Simpsons rule with n = 10 to approximate the intergral $\int_0^1 e^{x2}$ and compare the result with midpoint rule with n=10 (12 marks)

QUESTION THREE:

(a) Evaluate $\int_2^4 \frac{x^2 - 2x^2 - 3x - 2}{(x + 2)(x - 1)} \, dx$ using partial fractions (7 marks)

(b) Find the equation of tangent and normal to the curve
$y = x^3 - 2x^2 + 3x - 1$ at (2,5) (5 marks)

(c) Show that $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$ given
$y = Ae^{2x} + Be^{-3x}$ (5 marks)

(a) Find $\frac{dy}{dx}$ given $y = 2\sin\theta\cos\theta$ (3 marks)

QUESTION FOUR:

(a) Evaluate
$\lim_{x \to 3} \frac{2x + 3}{x - 4}$ (3 marks)

(b) Given $y = 2xe^{-3x}$ show that $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 0$ (4 marks)

(c) Use quotient rule to find the gradient of $y = \frac{(x^2 + 4x + 1)}{(x^2 + 2x + 3}$
at the point (1,1) (3 marks)

(d) (i) The domain of the function (f(x) is {1,2,3,4,5} find the range
if $(f(x) = 5x^2 + 3$ (5 marks)

(ii) Differentiate the following implicitly
$\sin y + x^2y^3 - \cos x = 2y$ (5 marks)

QUESTION FIVE:

(a) Evaluate $\int_2^3 \frac{x^3 - 2x^2 - 4x - 4}{x^2 - x - 2}\,dx$ correct
to (4s.f) using partial fractions (7 marks)

(b) Evaluate $\int x^2 \sin x\,dx$ (5 marks)

(c) Evaluate $\int_1^3 \frac{2}{rx}\,dx$ using the toapezoiadal rule with
4 intervals correct to 3 decimal places (4 marks)

(d) Find the volume of the solid generated by rotating about the y-axis
the area in the first quadrant enclosed by
$y = x^2$, $y = 1$, $y = 4$ and the y-axis (4 marks)