TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

Department Of Building and Civil Engineering

UNIVERSITY EXAMINATION FOR:

Diploma in Building and Civil Engineering (DBCE Y2 S1)

AMA 2250 ENGINEERING MATHEMATICS III

SPECIAL/ SUPPLIMENTARY EXAMINATIONS

SERIES: September 2018

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass, scientific calculator, student ID and no mobile phones.

This paper consists of five questions. Attempt question one compulsory and any other two questions

Do not write on the question paper.

Question ONE

(a) The curve y=ach$\frac{x}{a}$ revolves around the x-axis. Find the volume generated between the ordinates at x=0 and x=a (5mks)

(b) Find I by either putting x=ashz or integrating by parts

I=$\int \sqrt{a^2 + x^2}\ dx$ (6mks)

(c) Use the trapezium rule to estimate the area under the curve y=$\frac{1}{x}$ from x=1 to x=2 using six ordinates. Compare it by integration method. (6mks)

(d) Evaluate the following

i. $\int_0^{\pi/2}(sinx - cosx)dx$ (4mks)

ii. I=$\int 9x^3 + 11x^2 - x - 3)\ dx,$ given that when x=1 I=2 (4mks)

(e) Find the volume generated when the plane figure bounded by y=5cos2x, the x-axis And ordinates at x=0 and x=$\frac{\pi}{4}$ rotates about the x-axis through a complete revolution (5mks)

Question TWO

(a) Evaluate $\int_{0.2}^{1.0}\sqrt{1-x^3}\ \ dx$ using 8 intervals by Simpsons rule (10mks)

(b) Integrate by substitution if t=tan$\frac{x}{2}$ *then determine*

i. Sin x (2mks)

ii. Cos x (2mks)

iii. dx (2mks)

iv. $\int \frac{1}{1+\sin x - \cos x}$ dx (4mks)

Question THREE

(a) Find

i. $Tanh^{-1}$ in log form and hence (4mks)

ii. $Tanh^{-1}$ 0.5 (3mks)

(b) Find

i. $\int \frac{1}{\sqrt{(1-x^2}}\ dx$ by letting u=sin u (4mks)

ii. $\int \frac{2x-1}{(x+1)^2}\,dx$ by partial fractions (5mks)

iii. $\int \frac{dx}{(3x+2)^4}$ by substitution (4mks)

Question FOUR

(a) Given that area of the surface generated when the arc of the curve y=*f*(x) between x=x_1 *and* x_2, rotates about x-axis through a complete revolution is given by A=$\int_{X_1}^{X_2} 2\pi y\sqrt{1+(\frac{dy}{dx})^2}$ dx , find the area generated when the arc of the parabola $y^2=8x$ between x=0 and x=2 rotates about the x-axis (8mks)

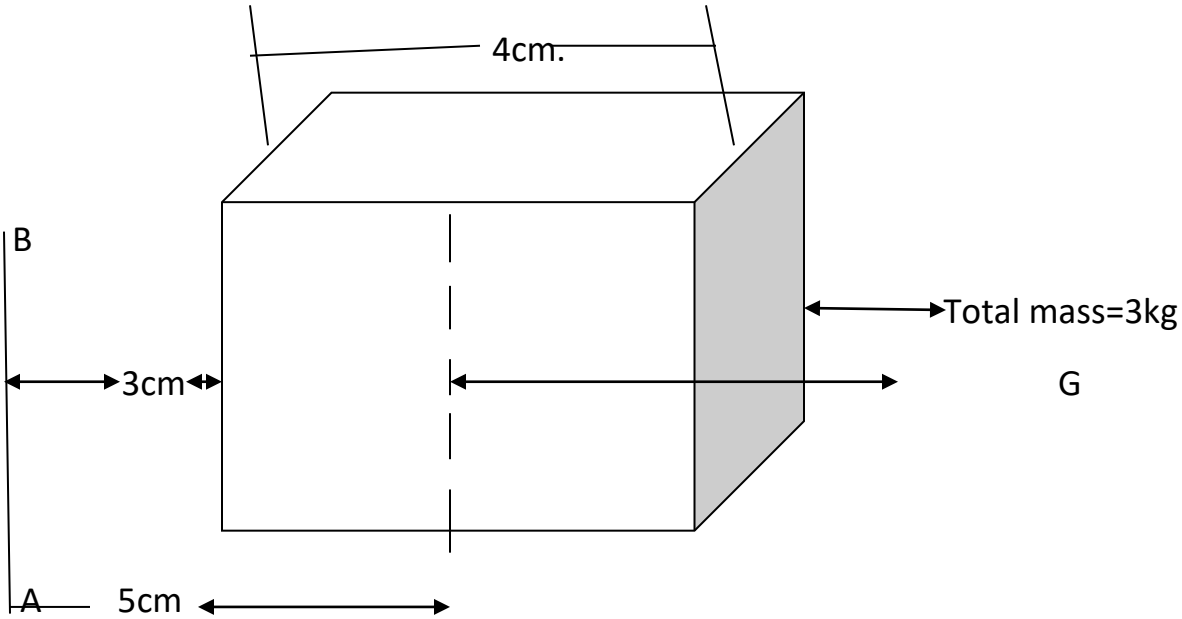
(b) A trench is to be dug in the form of a prismoid. The bottom is to be a rectangle 20.0m long by 14.0m wide. The top is also a rectangle 30.0m by 22.0m wide. If the depth of the trench is to be 10.0m. Find the volume of earth to be removed. (8mks)

(c) Use the standard integral that $\int \frac{1}{t^2+A^2}\,dt = \frac{1}{A}tan^{-1}(\frac{Z}{A})$+C to determine $\int \frac{1}{x^2+10x+30}\,dx$ (4mks)

Question FIVE

(a) By the use of inverse hyperbolic function expressed in logarithm, evaluate $\int_2^3 cosh^{-1}\,x \quad dx$ (5mks)

(b) Find the moment of inertia (I) about the axis AB for the rectangular plate shown below



(4mks)

(c) (i) find the length of the curve x=5(2t-sin2t) , y=10$sin^2 t$ between t=0 and t=π (8mks)

(ii).verify by integration that the area of the triangle formed by the line y=2x, the ordinates x=0 and x=6 and the x-axis is 36 square units (3mks)