NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
MAY/JUNE 2012 EXAMINATION

MTH 381 MATHEMATICAL METHOD III
TIME ALLOWED: 3HRS

INSTRUCTION: ANSWERS ANY 5 QUESTIONS

1. (a) Evaluate the integral $\int_0^1\int_0^1 (x^2+y^2)dydx$ -4 marks

(b) Evaluate the integral $\int_{\frac{-r}{2}}^{\frac{r}{2}}\int_0^{2\cos\theta} r^2 dr d\theta$

-10 marks

2. (a) Evaluate the integral $\int_{-1}^1\int_0^z\int_{x-z}^{x+z}(x+y+z)dydxdz$ -5 marks

(b) Verify stokes' theorem for $A=(2x-y)i-yz^2j-y^2zk$,where S is the upper half surface of the sphere $x^2+y^2+z^2=1$ and C is its boundary -9 marks

3. (a) Prove Green's theorem in the plane if C is a closed curve which has the property that any strenght line parallel to the coordinator axes cuts C in at most two points.-9 marks

(b) Find the laplace transform coskt -5 marks

4. (a) Verify Green's theorem in the plane for $\oint_c (xy+y^2)dx+x^2dy$,where C is the closed curve of the region bounded by $y=x$ and $y=x^2$ -7marks

(b) Solve by laplace transform the differential equation $y'''-4y'+4y=4e^{2t}$,given that $y(0)=-1, y'(0)=-4$ -7marks

5. (a) Express the divergence theorem in words and write it in rectangular form -6 marks

(b) Find the fourier coefficient of the period function *f(x)* where

$f(x)=\begin{cases} -1 \text{ if } -\pi<x<0 \\ 1 \text{ if } 0<x<\pi \end{cases}$ and $f(x+2\pi)=f(x)$ -8marks

6. (a) Evaluate $\int\int_s F\cdot n ds$,where $F=4xzi-y^2j+yzk$ and S is the surface of the cube bounded by

$x=0, x=1, y=0, y=1, z=0, z=1$ -8 marks

(b) Find $L^{-1}\left\{\frac{15}{s^2+4s+13}\right\}$

-6 marks

7. (a) Express stoke's theorem in words and write it in rectangular form -6 marks

(b) Prove that $L\left\{\frac{t^x}{\Gamma(x+1)}\right\}=S^{-x-1}$ -8 marks-