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

COURSE CODE: MTH381
COURSE TITLE: MATHEMATICAL METHOD III(3 units)
TIME ALLOWED:3 HOURS
INSTRUCTION: ANSWERS ANY 4 QUESTIONS

1. (a) Evaluate the integral $\int_{y=0}^{y=2}\int_{x=0}^{x=1}(2x^2+3y^2)dxdy$ **4marks**

(b) Evaluate the integeral $\int_{x=0}^{x=2}\int_{y=0}^{y=4-x^2}\int_{z=x}^{z=2} dzdydx$ **7 marks**

(c) Show that the functions e^t and e^{2t} are linearly independent on any interval**6½ marks**

2. (a) Evaluate the surface integral $I=\int_S\int(x^3dydx+x^2ydzdx+x^2zdxdy)$ where is the surface bounded

by $z=0, z=b$, $x^2+y^2=a^2$. **10 marks**

(b) Evaluate $\int_C(x+3y)dx$ from A(0,1) to B(2,5) along the curve $y=1+x^2$ **7½ marks**

3. (a) state Green's theorem on the boundary C of a region R in the $x-y$ plane **7½ marks**

(b) Evaluate the line integral $I=\oint_C\{xydx+(2x-y)dy\}$ round the region bounded by the curve

$y=x^2$ and $x=y^2$ by the use of Green's theorem. **10 marks**

4. (a) State Stoke's theorem and express it in rectangular form **7½ marks**

(b) Evaluate the integral $\int_{\frac{-r}{2}}^{\frac{r}{2}}\int_0^{2\cos\theta} r^2drd\theta$ **10 marks**

5. (a) Evaluate the periodic function $\int_{-\pi}^{\pi}\cos nxdx$ **7½ marks**

(b) Find the Fourier coefficients of the periodic function $f(x)$ where $f(x)=\begin{cases}-1 \text{ if } -\pi<x<0 \\ 1 \quad \text{if } 0<x<\pi\end{cases}$

and $f(x+2\pi)=f(x)$ **10 marks**

6. (a) Find the laplace transform of $f(t)=\sinh at$ **7½ marks**

(b) Determine $L^{-1}\left\{\frac{5s+1}{s^2-s-12}\right\}$ **10 marks**