

NATIONAL OPEN UNIVERSITY OF NIGERIA 14-16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS SCHOOL OF SCIENCE AND TECHNOLOGY JANUARY/FEBRUARY 2013 EXAMINATION

CODE:MTH 381	TIME: 3 HOURS
TITLE: MATHEMATICAL METHOD III	TOTAL: 70 MARKS

CREDIT UNIT: 3

INSTRUCTION: ANSWERS ANY 5 OUESTIONS

1.(a) The Laplace transform of an expression f(t) is definition as $L[f(t)] = \int_{t=0}^{\infty} f(t)e^{-st}dt$, show that $L[\sinh at] = \frac{a}{s^2 - a^2}$

$$s^2-a^2$$
 -6 marks (b) Evaluate (i) $L[2e^{-t}+t]$ -4 max

(ii)
$$L[2\sin 3t + \cos 3t]$$
 -4 marks

-4 marks

2. (a) Evaluate the integral
$$\int_0^1 \int_0^1 (x^2 + y^2) dy dx$$
 -4 mag

(b) (i) Evaluate
$$\int_c (x+3y)dy$$
 from $A(0,1)$ to $B(2,5)$ along the curve $y=1+x^2$. -6 marks

(ii) Evaluate the line integral
$$I=\int_c \left(x^2 dx - 2xy dy\right)$$
 where c comprises the three sides of the triangle

joining
$$o(0,0)$$
 , $A(1,0)$ and $B(0,1)$. -6 marks

3. (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 $y=x^2$ -7 marks

(b) Evaluate
$$I=\oint_c \left[(2x-y)dx+(2y+x)dy\right]$$
 around the boundary c of the ellipse $x^2+9y^2=16$ -7 marks

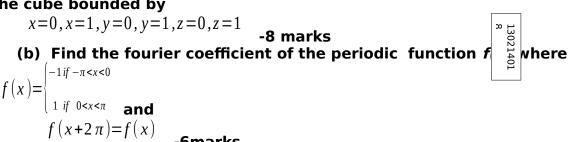
4. (a) Find the area of the surface
$$z=\sqrt{\chi^2+y^2}$$
 over the region bounded by $x^2+y^2=1$ -8 marks

(b) Find the volume of the solid bounded by the planes

$$z=0, x=0, y=0, x^2+y^2=4$$
 and $z=6-xy$ for $x \ge 0, y \ge 0, z \ge 0$ -6 marks

 $x \ge 0, y \ge 0, z \ge 0$ -6 marks 5. (a) Evaluate $\int_{-\infty}^{\infty} \int_{s}^{\infty} F \cdot n ds$,where $F = 4xzi - y^2j + yzk$ and S is the surface of the cube bounded by

$$x=0, x=1, y=0, y=1, z=0, z=1$$



6. (a) State stoke's theorem and express it in rectangular form -6 marks

$$\int_{-\frac{r}{2}}^{\frac{r}{2}} \int_{0}^{2\cos\theta} r^2 dr d\theta$$
b) Evaluate the integral

(b) Evaluate the integral

-8 marks

- 7. (a) Express the divergence theorem in words and write it in rectangular form -6 marks
 - (b) Solve by laplace transform the differential equation

y"'-4y'+4y=4
$$e^{2t}$$
 ,given that $y(0)$ =-1, $y'(0)$ =-4 -8 marks