(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

FORTH YEAR SECOND SEMESTER

SPECIAL/SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

COURSE CODE: MAT 432

COURSE TITLE: METHODS II

DATE: 02/02/2021 **TIME:** 8 AM - 10 AM

INSTRUCTIONS TO CANDIDATES

Answer Question **One** and Any other **TWO**

QUESTION ONE (30MARKS)

a) Given the expression $f(x, y) = 4y^2 + 3x^2 + 2xy$, show that

$$\frac{\partial^2 f}{\partial x^2} - \frac{\partial^2 y}{\partial y^2} = -2$$ (6 mks)

b) Find the equation of the tangent to the polar equation $r = 6cos\theta \; at \; \theta = \frac{\pi}{3}$ (8 mks)

c) Convert the polar coordinates $(2.35, \frac{-2\pi}{3})$ to rectangular coordinates (4 mks)

d) Evaluate $\int_0^4 \int_0^x \int_0^{x+y} zdzdydx$ (6 mks)

e) Given that $y = 2\cos(x+1) - 3\sin(x-1)$, show that $\frac{\partial^2 x}{\partial x^2} + y = 0$ (6 mks)

QUESTION TWO (20 MARKS)

a) Given that $f(t) = e^{2t} \; and \; h(t) = e^{-4t}$, show that $f * g = g * f$ (8 mks)

b) Show that the curves with polar equations intersect at right angle

$r = asin\beta \; and \; r = rcos\beta$ (7 mks)

a) Convert the polar equation to rectangular form $r = 4(1 - 2cos\theta)$ (5 mks)

QUESTION THREE (20 MARKS)

a) (i) State Green's theorem for $\varphi(x, y) \; and \; \varphi(x, y)$ (5 mks)

(ii) Use Green's theorem to evaluate $\oint(3x^2 - 8y^2)dx + (4y - 6xy)dy$ where C is the boundary of the region bounded by $x \geq 0, y \leq 0 \; and \; 2x - 3y = 6$ (8 mks)

b) Find the Cartesian equation for the polar equation $r = a(cos\theta = sin\theta)$ (7 mks)

QUESTION FOUR (20 MARKS)

a) Convert the polar equation to rectangular form $r = \frac{1}{sin\theta - cos\theta}$ (8 mks)

b) Given that $x^4 + x^3y^{2+}y^5 - 6 = 0$, use implicit function theorem to find $\frac{dy}{dx}$ (8 mks)

c) State the inverse convolution theorem if $L[f_1(t) = F_1(S) \; and \; L[f_2(t) = F_2(S)$ (4 mks)

QUESTION FIVE (20 MARKS)

a) Use convolution to find the inverse laplace transform of

$$\frac{s+2}{s(s-1)}$$ (10 mks)

b) Verify Gauss divergence theorem by evaluating $\iint_s (3x_i - 2y_j)dA$ where S is the sphere $x^2 + y^2 + z^2 = 9$ (10 mks)