

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EMBU CAMPUS

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS

MATH 420: PARTIAL DIFFERENTIAL EQUATION (I)

STREAMS: B.SC (GENERAL) SB

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 5/12/2018

2.30 P.M - 4.30 P.M.

INSTRUCTIONS

- Answer Question ONE and any other TWO Questions

QUESTION ONE: [30 MARKS]

- a) Find the direction cosines of the normal to the plane $x + 2y + z = 5$ and the distance from the origin [5 Marks]

- b) Find the integral curve of the equation $\frac{dx}{y(x+y)+az} = \frac{dy}{x(x+y)-az} = \frac{dz}{z(x+y)}$ [6 Marks]

- c) Solve the Pfaffian Differential equation $xz^3 dx - zdy + 2ydz = 0$ [5 Marks]

- d) Eliminate a and b from the equation $z = ax + (1-a)y + b$ [4 Marks]

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- e) Show that the equation $xp = yq, z(xp + yq) = 2x$ are compatible [6 Marks]

$$x^2 \frac{\partial z}{\partial x} + y^2 \frac{\partial z}{\partial y} = (x + y)z$$

- f) Find the general solution of the semi-Linear Equation [4 Marks]

QUESTION TWO

- a) Show that the directional of the tangent at a point (x, y, z) of the intersection of the conic $ax^2 + by^2 + cz^2 = 1$ and the plane $x + y + z = 1$ are proportional to $(by - cz, cz - ax, ax - by)$ [4 Marks]

$$\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$$

- b) Find the integral curves of the set of the equation [8 Marks]

$$(yz + z^2)dx - xzdy + xydz = 0$$

- c) Solve [8 Marks]

QUESTION THREE: 20MARKS

- a) Find the integral curves of the set of the equations $x(y^2 + z)p - y(x^2 + z)q = (x^2 - y^2)z$ which contain straight line $x + y = 0, z = 1$, [10 Marks]

- b) Find the surface which is orthogonal to the one parameter system $z = cxy(x^2 + y^2)$ which passes through hyperbola $x^2 - y^2 = a^2, z = 0$; [10 Marks]

QUESTION FOUR: 20MARKS

- a) Solve by the charpit Method of the differential equation $(q^2 + 1)z^2 = 2pxz + x^2$ and find the corresponding complete integral of the equation. [10 Marks]

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- b) Find the directional cosines normal to the plane $z = 1$ and the distance of the plane from the origin. [3 Marks]

$$\frac{dx}{mz - ny} = \frac{dy}{nx - lz} = \frac{dz}{ly - mx}$$

- c) Find the integral surface of the curve [7 Marks]
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