ALUPE UNIVERSITY COLLEGE

Bastion of Knowledge...

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OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017 /2018 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER REGULAREXAMINATION

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE & APPLIED STATISTICS AND COMPUTING

COURSE CODE: MAT 111

COURSE TITLE: GEOMETRY AND ELEMENTARY APPLIED MATHEMATICS

DATE: 18TH APRIL, 2018   TIME: 9AM – 12.00 NOON

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 4 PRINTED PAGES   PLEASE TURN OVER

MAT 111: GEOMETRY AND ELEMENTARY APPLIED MATHEMATICS

STREAM: BSc (CS/ASC)   DURATION: 3 Hours

INSTRUCTION TO CANDIDATES

i.   Answer *ALL* questions from *section A* and any *THREE* from *section B*

ii. Do not write on the question paper.

SECTION A [31 Marks] ANSWER ALL QUESTIONS

Question one (16 marks)

a) Find all points of intersection of $r = \cos 2\theta, r = \sin \theta$ (4mks)

b) Find the distance between the points $P_1(1,4), P_2(-3,2)$ (3mks)

c) Show that the points $A(-1,-2), B(4,-1), C(5,4), D(0,3)$ are vertices of a rhombus   (5mks)

d) Obtain the asymptote of $y = \frac{1}{x}$ (4mks)

Question two (15 marks)

a) By drawing up a table of r and θ values , $0^0 < \theta > 360^0$,plot the graph of $r = 1 + \cos \theta$ (3mks)

b) Find the Cartesian equation of the polar equation $r \cos(\theta - \alpha) = p$ (3mks)

c) Find the unit tangent and normal vector to the curve $4x^2 + 6 = y$ at the point $(1,1)$ (5mks)

d) Obtain the distance between the points $(2,-2,1)$ and $(3,0,-1)$ (4mks)

SECTION B: [39marks] ANSWER ANY THREE QUESTIONS

Question three (13 marks)

a) Obtain the direction of the line from the origin to the point $(6,-2,3)$ (4mks)

b) For a line through the points $(0,1,-2)$ and $(1,5,6)$, obtain its

    i.   Direction numbers   (3mks)

ii. Direction cosines (3mks)

c) Obtain the distance from the point $(2,-3,-1)$ to the plane $2x - 3y + 6z + 7 = 0$ (3mks)

Question four (13 marks)

a) Obtain the equations of a line through the points $(1,2,-1),(2,2,0)$ (4mks)

b) Find the Cartesian equation for the plane through $P_0(-3,0,7)$ and perpendicular to the vector $\vec{N} = 5i + 2j - k$ (5mks)

c) A projectile is fired over a horizontal line at an initial speed of $500m/s$ at an angle of elevation of 60^0. Where will the projectile be after $10s$. (4mks)

Question five (13 marks)

a) Three masses 8kg, 5kg and 2kg are located on the x axis at distances of 2m, 3m and 6m respectively. How far from the origin is the center of mass of the system (4mks)

b) Find the equation of a plane through the point $(4,3,6)$ and perpendicular to the line joining that point to the point $(2,3,1)$ (5mks)

c) A particle is projected vertically upwards at a velocity of 4.9m/s. Calculate the time taken to return to its point of projection and distance it travels. (4mks)

Question six (13 marks)

a) Define

    i. Relative motion (2mk)

    ii. Friction (2mk)

    iii. Moments (2mk)

    iv. Couples (2mk)

b) Find the velocity of the plane relative to the ground if its velocity relative to the wind is 200m/h due east and the velocity of the wind relative to the ground at 40m/h due North. Find by what angle the plane will change course. (5mks)

Question seven (13 marks)

a) Find two sets of directional cosines and indicate the direction along the line joining the points $A_1(3,1,2), A_2(5,2,-4)$ (5mks)

b) Express $\left(2, \dfrac{\pi}{6}\right)$ in rectangular coordinates (5mks)

c) State the applications of gradients (3mks)

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