**TECHNICAL UNIVERSITY OF MOMBASA**

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS AND PHYSICS

**UNIVERSITY EXAMINATION FOR:**

DIPLOMA IN MARINE ENGINEERING

EMR 2211: ENG MATHS IV.

END OF SEMESTER EXAMINATION

**SERIES:**MAY 2016

**TIME:** TWO HOURS

**DATE:**MAY 2016

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student ID*

This paper consists of **FIVE** questions. Attempt Question **ONE** and any other **TWO**.

**Do not write on the question paper.**

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**Question ONE**

(a) Find the integral of $y= (2x+ 5) (x^2 +5x)^7$ (4mks)

(b) A radar on Thika super highway is used to measure speeds of vehicles. The speeds are normally distributed with mean of 90 Km/h and standard deviation 10 Km/h. Find the probability that a car picked at random has a speed greater than 100Km/h (4mks)

(c) In how many ways can a committee of 5men and 6 women be chosen from a pool of 8 men and 10 women? (3mks)

(d) Using binomial expansion, determine the first five terms of the expansion: $\left(2 - 1/x\right)^8$ hence use the expansion above to evaluate $(1.75)^8$ (4mks)

(e) Given the function $f(x,y) = 2x^3 +6xy^2 -3y^3 -150x$ obtain $f_x$, $f_{yy}$ and $f_{xy}$ (4mks)

(f) Determine the stationary points of the function $y =27x –x^3$ and distinguish their nature (5mks)

(g) Work out $\frac{1\ !}{1\ !3!}$ (2 mks)

(h) Find $\frac{d}{d}$ if $y = (2x^2 +6x) (2x^3 +5x^2)$ (4mks)

**Question TWO**

(a) Determine the critical points and locate any relative maxima, minima and saddle point of the function defined by $f(x,y) = 2x^2 -2xy +2y^2 – 6x$ (7mks)

(b) Use first principles to find derivative of $f(x) = x^3 + x^2$ (5mks)

(c) A trough of water is 8m deep and its ends are in the shape of isosceles triangle with a width of 5m and height 2m. If water is being pumped into it at $6m^3$/sec, at what rate is the height changing if initial height is 120cm? (5mks)

(d) If in a normal distribution mean= 50 and standard deviation is 15 find pr(50< x<70) (3mks)

**Question THRE**

(a) A variable X is normally distributed with a mean of 30 and standard deviation of 4 find

(i ) P(x<40) (3mks)

(ii ) P(x>21) (3mks)

(iii ) P(30<x<35) (4mks)

(b) A particle moves in a straight line such that its velocity VMs is given by :

$V = 32 + 4t - t^2$ after t seconds.

Calculate;

(a) Its initial velocity ( 2 marks )

(b) The acceleration when it comes to rest. ( 4 marks

(c ) the distance traveled in the seventh second. ( 4 marks )

**Question FOUR**

(a) When a circular shield of bronze is heated over fire, its radius decreases at a rate of 0.2 cm/sec. At what rate is the area of the shield increasing if the radius is 50cm? (5mks)

(b) Find y' if $y= (2x^3 -1)^4$ (4mks)

(c) From a group of 7 men and 6 women, 5 people are to be selected. In how many ways can this be done so as to ensure that at least 3 men are included in this group (4 mks)

(d) Find integral of $\frac{10x}{5x^2 -8}$ (4mks)

(e) Find the area enclosed by $y = 2x^3 + 4x$ the x axes and the points x=1 and x= 2 (3mks)

**Question FIVE**

(a) A blindfolded marksman finds that an on average he hits the target 4 out of 5 times. If he fires 4 shots, find the probability that he gets

(i.) More than 2 hits (4mks)

(ii.) At least 3 misses (4mks)

(b) Hospital records show that of the patients suffering from Cancer, 75% die. What is the probability that out of 6 randomly selected patients 4 will recover? (4mks)

(c) If electricity power failure occur according to a poison distribution with an average of 3 failures every 20 weeks. Calculate the probability that there will be more than one failure during a particular week. (4mks)

(d) A ball is thrown vertically upwards such that its height after t seconds is given by $h= 4t^2 -16t +20$. Find the maximum height the ball reaches (4mks)