



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.

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: $\left(2 - \frac{1}{x}\right)^8$ 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 $\frac{d}{dx}$ 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 $6\text{m}^3/\text{sec}$, 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 $\text{pr}(50 < x < 70)$ (3mks)

Question THREE

- (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 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 poisson 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)