

KABARAK



UNIVERSITY

**UNIVERSITY EXAMINATIONS
2010/2011 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE**

COURSE CODE: MATH 410

COURSE TITLE: PARTIAL DIFFERENTIAL EQUATION

STREAM: SESSION VII

DAY: THURSDAY

TIME: 2.00 – 4.00 P.M.

DATE: 14/04/2011

INSTRUCTIONS:

- Ø Answer question **ONE** and any other **TWO** questions
- Ø Show **ALL** your workings

PLEASE TURN OVER

QUESTION ONE (30MARKS)

- (a) Given $y = x^2 \sin x$ deduce the product Rule. (3 marks)
- (b) (i) Find $\lim_{x \rightarrow \infty} \frac{1}{x}$ (3 marks)
- (ii) Find $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ (3 marks)
- (c) Use first principles to find the derivative of
- (i) $f(x) = 6$ (3 marks)
- (ii) $f(x) = x^2$ (3marks)
- (d) Show that $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ (3 marks)
- (e) Find the equation of the line which passes through the point (5,3) and is parallel to the tangent to the curve, $y = x^2$ at the point (3, 9) (3marks)
- (f) Differentiate the following functions:
- (i) $y = (x - 5)(x - 2)$ (3 marks)
- (ii) $y = \frac{1}{x}$ (3 marks)

QUESTION TWO (20 MARKS)

- (a) Use the first principles to find the derivative of: $y = \cos x$. (8 marks)
- (b) For the function defined by $y = 2x^2 - 15x + 19$, Find the stationary points and distinguish between them. (6 marks)
- (c) If $\sin^2 x + \cos^2 x = 1$ (6 marks)

QUESTION THREE (20 MARKS)

- (a) A particle moves along a straight line in such a way that its distance from a fixed point o on the line after t seconds is S meters, where $S = -t^3 + 12t^2 - 20t$. Find;
- (i) Its velocity after 3 seconds and after 4 seconds (3 marks)
- (ii) Its acceleration after 2 seconds and after 4 seconds (3 marks)
- (b) Find the equation of the normal to the curve $y = x^2 + 3$ at the point where $x = 1$ (6 marks)
- (c) Find $\frac{dy}{dx}$, given that $f(x) = x^2 + 2x + 3$ (3 marks)
- (d) Evaluate $\lim_{x \rightarrow \infty} \frac{1}{x}$ (3 marks)

QUESTION FOUR (20 MARKS)

(a) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ if $x^2 + 2xy + 4y^2 = 0$ at a point $(1, 1)$ (15 marks)

(b) A 2% error is made in measuring the radius of a sphere. Find the percentage error in surface area. (5 marks)

QUESTION FIVE (20 MARKS)

(a) Differentiate the following:

(i) $\frac{d}{dx} (x^2 + 2x + 1)$ (3marks)

(ii) $\frac{d}{dx} x^2$ (3 marks)

(b) Find $\frac{dy}{dx}$ when $x = 1$, $\frac{dy}{dx} = \frac{1}{2}$ and $\frac{d^2y}{dx^2} = 3 - 1$ (8 marks)

(c) Find the equation of the curve given the gradient is $4x - 2$ and the curve passes through point $(1, 2)$ (4marks)

(d) evaluate $\lim_{x \rightarrow 0} \frac{1}{x}$ (2 marks)