CHRIST HIGH SCHOOL PLOT 5, CHS STREET, KM 32, ABUJA-KEFFI ROAD UKE, NASARAWA STATE

FIRST TERM EXAMINATION
2024/2025 ACADEMIC SESSION

SUBJECT: FURTHER MATHEMATICS (PAPER II)
CLASS: SS 3
TIME: 3HOURS

NAME……

CANDIDATE'S ADMISSION NO.

INSTRUCTION

Write your name and number in the space provided on your answer booklet. Write your name on any extra sheet used.

At the end of the examination, staple all your work securely together.

Answer all theory questions in part 1 and any four in part 2

FOR EXAMINER'S USE	
Total Score:	+

PAPER II

PART I: ANSWER ALL QUESTIONS (Each question = 8marks)

1. (a) Find the first derivative of $\frac{x^3+2x}{(3x-1)^2}$.

(b) (i.) Evaluate the determinant of **A=** $\begin{pmatrix} -1 & 2 & 2 \\ -2 & 0 & 3 \\ 3 & 1 & 3 \end{pmatrix}$

(ii) Solve the systems of equation.

$$\begin{aligned} x + \quad & 3y - \quad z = 1 \\ -2x + \quad & y - \quad z = -1 \\ 3x + \quad & 2y + \quad z = 1 \end{aligned}$$

2.(a) Use the trapezoidal rule, with seven ordinates, evaluate correct to three decimal places; $\int_0^1 (3x+1)x^2 dx$.

(bi) the adjacent sides of a parallelogram are **AB** = 4**i** – **j** + 3**k** and **AC**= -2**i** + **j** – 2**k**. Find the area of the parallelogram.

(bii). If **A** = a_1**i** + a_2**j** – a_3**k**, and **B** = b_1**i** + b_2**j** - b_3**k** find **A**×**B**.

3. (a) Find the binomial expansion of $(1+3x)^6$.

(b) The first term of an Arithmetic Progression A.P is -2, the last term is 101 and the sum of terms is 198. Find;

i. the number of terms in the series

ii. The common difference

iii. The third term.

4a) Find the equation of a circle with center $(3, 3)$ and radius 3 units.

b) Find the third derivative of $y = e^{4x}$

c) Evaluate: $\lim_{x\to\infty} \frac{x3-2x^2+3x+1}{3x^3+2x^2+2}$

5a) Find the length of the tangent to the circle $x^2 + y^2 - 2x - 4y - 4 = 0$ from the point (4, 6)

b) Find the equation of a circle whose center is the origin and radius is 7 units.

c) Find the remainder when $f(x) = 2x^3 + 3x^2 - 4x + 1$ is divided by $2x - 1$. what conclusion can you draw from your result.

PART II

ANSWER FOUR QUESTIONS ONLY (Each question = 12marks)

6. The probabilities that Abu, Michael and Sandra will gain admission to a certain university are $\frac{3}{5}, \frac{3}{4}$ and $\frac{2}{3}$ respectively. Find the probability that:

i. None of them will gain admission
ii. Only Abu and Michael will gain admission.

b) Find the derivative of $\sin x$ from first principle.

7. A particle of mass 2 kg moves under the action of a constant force, $F\ N$, with an initial velocity $(i + 2j)ms^{-1}$ and a velocity $(3i - 4j)ms^{-1}$ after 4 *seconds.* Find the:

a. Acceleration of the particle.

b. Magnitude of the force F.

c. Magnitude of the velocity of the particle after 10 *seconds*, correct to three decimal places.

8. If $\frac{3x^2+3x-2}{(x-1)(x+1)} = P + \frac{Q}{x-1} + \frac{R}{x+1}$, find the values of Q and R.

9. The motion of a particle from O, is described by the equation $S = \frac{2}{3}t^3 - \frac{17}{2}t^2 + 21t$ where S is the distance in metres, and t the time in seconds. Find the acceleration of the particle when it is momentarily at rest.

10. If f(x+2) = $6x^2 + 5x - 8$, find f(5)

(b) Express $\frac{7\sqrt{2}+3\sqrt{3}}{4\sqrt{2}-2\sqrt{3}}$ in the form p + q$\sqrt{r}$, where p, q and r are rational numbers.

11. Find the derivative of $4x - \frac{7}{x^2}$, with respect to x, from **first principle.**

b) Simplify: $\frac{\log\sqrt{27}-\log\sqrt{8}}{\log 3-\log 2}$.

12. A basket contains 12 fruits: orange, apple and avocado pear, all of the same size. The number of oranges, apples and avocado pear forms three consecutive integers. Two fruits are drawn one after the other without replacement. Calculate the probability that:

a) the first is an orange and the second is an avocado pear.

b) both are of the same fruit.

c) at least one is an apple.

13. Solve $2^{2y+1} - 5(2^y) + 8 = 6$.

b) The gradient of a function at any point (x, y) is $2x - 6$. If the function passes through $(1, 2)$, Find the function.

c) Find the equation of a Parabola with focus at (3, 0) and directrix $x = -3$.

14. a) Express $\frac{8x^2+8x+9}{(x-1)(2x+3)^2}$ in partial fractions.

b) Evaluate $\int_1^3 \frac{x-1}{(x+1)^2}\,dx$.

15. The table shows the heights in cm of some seedlings in a certain garden.

Height (cm)	36 - 40	41 - 45	46 - 50	51 -55	56 – 60
Frequency	3	9	21	12	5

a) Draw a cumulative frequency curve for the distribution.

b) Without using the curve above, find the semi-interquartile range.