REPUBLIQUE DU CAMEROUN
Paix-Travail-Patrie

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TEACHERS' RESOURCE UNIT TRU-RIP-STA MOCK EXAMS CAMP. BAMENDA NORTH WEST REGION

A

REPUBLIC OF CAMEROON
Peace-Work-Fatherland

MINISTRY OF SECONDARY EDUCATION

TEACHERS' RESOURCE UNIT
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MARCH 2023

The Teachers' Resource Unit and the Regional Inspectorate of Pedagogy, in collaboration with MTA	SUBJECT CODE NUMBER 0775	PAPER NUMBER 1
GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION		
CANDIDATE NAME: ..... CANDIDATE NUMBER: ..... CENTRE NUMBER:	SUBJECT TITLE FURTHER MATHEMATICS	
ADVANCED LEVEL		

Time Allowed: One and a half hours

INSTRUCTIONS TO CANDIDATES:

Mobile phones are **NOT ALLOWED** in the examination room.

1. USE A SOFT HB PENCIL THROUGHOUT THIS EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the Examination begins:

3. Check that this question booklet is headed "Advanced level –0775 code and subject title—"FURTHER MATHEMATICS Paper 1".
4. Insert the information required in the spaces above.
5. Without opening the booklet, pull out the answer sheet carefully from inside the front cover of this booklet. Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.
6. Insert the information required in the spaces provided on the answer sheet using your HB pencil:

Candidate Name, Centre Number, Candidate Number, Subject Code Number, and Paper number

How to answer questions in this examination:

7. Answer ALL the 50 questions in this examination. All questions carry equal marks.
8. Non-programmable calculators are allowed.
9. For each question there are four suggested answers, A, B, C and D. Decide which answer is correct. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen. For example, if C is your correct answer, mark C as shown below:

[A] [B] [C] [D]

10. Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
11. Avoid spending much time on any question. If you find a question difficult, move to the next question. You can come back to this question later.
12. Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
13. **You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination.**

1. $\int sinh^2 x dx =$
   A. $\frac{1}{4}(sinh2x + 2x) + C$
   B. $\frac{1}{4}(sinh2x - 2x) + C$
   C. $\frac{1}{4}(cosh2x + 2x) + C$
   D. $\frac{1}{4}(sinh2x + x) + C$

2. The polar equation $r = -8cosx$ represents
   A. a circle
   B. a hyperbola
   C. a parabola
   D. an ellipse

3. The values of u for which
$$\begin{vmatrix} 6-u & 0 & 1 \\ -1 & -6-u & -2 \\ 5 & 0 & u \end{vmatrix} = 0 \text{ are}$$
   A. $-1, -5, -6$
   B. $1, -5, 6$
   C. $-1, 5, -6$
   D. $1, 5, -6$

4. If a particle moves along a straight line OX such that its displacement x meters from O at time t seconds is given by the differential equation $\frac{d^2y}{dx^2} + x = 0$, then its period of motion is
   A. $\frac{\pi}{3}$
   B. $\frac{2\pi}{\sqrt{3}}$
   C. $\frac{\pi}{2}$
   D. 2π

5. The distance between the planes $x + y - z = 3$ and $x + y - z = -6$ is
   A. $3\sqrt{3}$
   B. 9
   C. 3
   D. $\sqrt{3}$

6. If $f(x) = \int_a^x \frac{2t}{\sqrt{t^2+1}} dt$. then $a \geq 0, f$
   A. is concave downwards
   B. is monotone increasing
   C. has a turning point
   D. is monotone decreasing

7. A group H has a subgroup $\{x, y\}, \{x, y, w, u, v\}$ and $\{x, w\}$. The identity element of H is:
   A. w
   B. y
   C. x
   D. u

8. Which of the following series is convergent?
   A. $\sum_{n=1}^{\infty} \frac{1}{n}$
   B. $\sum_{n=0}^{\infty} \frac{3^n}{n!}$
   C. $\sum_{n=0}^{\infty} (1-n)^n$
   D. $\sum_{n=0}^{\infty} n(1+n)$

9. A particle moves round a polar curve $r = a(1 + cos\theta)$ with constant angular velocity ω. The transverse component of its velocity is:
   A. $a\omega(1 - sin\theta)$
   B. $-acosin\theta$
   C. ω
   D. $a\omega(1 + cos\theta)$

10. If ω is the complex cube root of unity, the value of $\omega^4 + \omega^8$ is
   A. -1
   B. 1
   C. -2
   D. 2

11. $\int \frac{1}{9x^2+4} dx =$
   A. $\frac{1}{3} tan^{-1}\left(\frac{3x}{2}\right) + C$
   B. $\frac{1}{6} tan^{-1}\left(\frac{3x}{4}\right) + C$
   C. $\frac{1}{3} tan^{-1}\left(\frac{3x}{5}\right) + C$
   D. $\frac{1}{6} tan^{-1}\left(\frac{3x}{2}\right) + C$

12. Which of the following is not correct?
   A. Differentiability implies continuity
   B. Continuity implies differentiability
   C. Conflexion implies continuity
   D. Conflexion implies differentiability

13. Given the sequence $U_n = \ln(n^2 + 1) - 2\ln n$, for all natural numbers $n, n \neq 0$, then the lower and upper bounds are respectively
   A. 0 and 1
   B. 1 and 2
   C. 0 and ln2
   D. 1 and ln2

14. The type of curve represented by the equation $x^2 + xy + y^2 - 1 = 0$ is:
   A. an ellipse
   B. a hyperbola
   C. a parabola
   D. a circle

15. A sequence is defined recursively as $a_1 = a_2 = 1, a_n = a_{n-1} + a_{n-2}, n \geq 3$. The seventh term is:
   A. 8
   B. 21
   C. 5
   D. 13

16. Given the equation of a hyperbola as $b^2x^2 - a^2y^2 = a^2b^2$, then the equations of the asymptotes are:
   A. $y = \pm\frac{a}{b}x$
   B. $y = \pm\frac{b}{a}x$
   C. $x = \pm\frac{a}{b}y$
   D. $x = \pm\frac{b}{a}y$

17. The parametric equations of the rectangular hyperbola $x(y + 1) = c^2$ are:
   A. $x = ct, y = \frac{c}{t} - 1$
   B. $x = ct, y = \frac{c}{t} + 1$
   C. $x = 1 + ct, y = \frac{c}{t}$
   D. $x = ct, y = \frac{c}{t}$

18. The mean value of $\frac{1}{1+4x^2}$ for $0 \leq x \leq \frac{1}{2}$ is:
   A. $\frac{\pi}{2}$
   B. $\frac{\pi}{4}$
   C. $\frac{\pi}{8}$
   D. $\frac{\pi}{16}$

19. Given that P and Q are 3×3 invertible matrices, then $(P^{-1}Q)^{-1} =$
A. QP^{-1}
B. $Q^{-1}P^{-1}$
C. $Q^{-1}P$
D. PQ^{-1}

20. Given that $\lim_{x \to 0}\left[\frac{\sqrt{1+f(x)}}{x}\right] = l$, then $\lim_{x \to 0}\left[\frac{\sqrt{1+f(3x)}}{x}\right] =$
A. $3l$
B. $\sqrt{3l}$
C. $\frac{1}{2}l$
D. $\frac{1}{3}l$

21. If $\bar{a} = i + j$, $\bar{b} = 2i - j$, then $\bar{a} \times \bar{b} =$
A. $0\bar{k}$
B. 0
C. $\bar{\imath}$
D. $-3\bar{k}$

22. The cofactor of the element 6 in $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ is:
A. $\begin{vmatrix} 7 & 8 \\ -1 & -2 \end{vmatrix}$
B. $\begin{vmatrix} -1 & -2 \\ 7 & 8 \end{vmatrix}$
C. $\begin{vmatrix} -1 & -2 \\ -7 & -8 \end{vmatrix}$
D. $\begin{vmatrix} 1 & 2 \\ 7 & 8 \end{vmatrix}$

23. The equations $\begin{cases} x - 2y + 4z = 0 \\ 2x - 4y - 3z = 0 \end{cases}$
A. are inconsistent
B. represent a pair of intersecting lines
C. have a unique solution
D. have solutions depending on one parameter

24. If $f(x) = \tanh x$, then $f(x)$ is
A. periodic
B. discontinuous
C. continuous
D. even

25. The equation $5x^3 - 9x^2 + 12x + 4 = 0$
A. has roots α, β and δ where $\alpha\beta\delta = \frac{2}{5}$
B. has three real roots
C. has a repeated root
D. has a root between 0 and 1

26. If the period of a function $f(x)$ is T, then the period of $f(2x + k)$, where k is real is:
A. 2T
B. $\frac{1}{4}$T
C. T
D. $\frac{1}{2}$T

27. Given that $f(x) = x^2 + 2x$ and $g(x) = 3x^3 + 6x^2, x > 0$, the gcd for f and g is:
A. x
B. $x + 2$
C. $x^2 + 2x$
D. $3x + 6$

28. The moment of inertia of an object of mass $2m$ is $\frac{8ma^2}{3}$. Its radius of gyration is:
A. $\frac{4a^2}{3}$
B. $\frac{1}{2a}\sqrt{3}$
C. $\frac{2\sqrt{3}}{3}a$
D. $\frac{a}{3}\sqrt{3}$

29. The integrating factor of the differential equation $\frac{dy}{dx} + \frac{2y}{x} = 1$ is I=
A. x^2
B. $\frac{1}{x}$
C. $-\frac{1}{x}$
D. $-x^2$

30. The number x, of bacteria in a culture decreases at a rate equal to twice the number of bacteria present at time t. The differential equation describing this situation where k is a positive constant is:
A. $\frac{dx}{dt} - 2kx = 0$
B. $\frac{dx}{dt} + 2kx = 0$
C. $\frac{dx}{dt} = kx$
D. $\frac{dx}{dt} = -2k$

31. The equation $\frac{d^2y}{dx^2} + 2k\frac{dy}{dx} + n^2x = 0$ represents a damped harmonic motion if:
A. $k^2 = n$
B. $k^2 < n^2$
C. $2k = n^2$
D. $k^2 > n^2$

32. $\int \frac{1}{\sqrt{x^2+3x-1}}dx =$
A. $cosh^{-1}\frac{3}{\sqrt{13}}\left(x + \frac{3}{2}\right) + k$
B. $\sqrt{\frac{4}{13}}sinh^{-1}\left(x + \frac{3}{2}\right) + k$
C. $sinh^{-1}\left(x + \frac{3}{2}\right) + k$
D. $\sqrt{\frac{14}{13}}cosh^{-1}\left(x + \frac{3}{2}\right) + k$

33. The work done by a force **F** in moving a particle of mass m from a point A with position vector **a** to a point B with position vector **b** is
A. $\mathbf{F} \times (\mathbf{b} - \mathbf{a})$
B. $m\mathbf{F}.(\mathbf{b} - \mathbf{a})$
C. $\mathbf{F}.(\mathbf{b} - \mathbf{a})$
D. $m\mathbf{F} \times (\mathbf{b} - \mathbf{a})$

34. The equation of the asymptote of the curve $x^3 + y^3 - 6x^2 = 10$ is:
A. $y = x + 2$
B. $y = -x + 2$
C. $y = x$
D. $y = -x$

35. $\sum_{k=1}^{2n}(-1)^k =$
A. 0
B. ∞
C. 1
D. -1

36. The range of the function $y = \frac{x}{x^2+1}$, for real values of x is:
A. $-\frac{1}{2} \leq y < \frac{1}{2}$
B. $-\frac{1}{2} \leq y \leq \frac{1}{2}$
C. $y < -\frac{1}{2}, y > \frac{1}{2}$
D. $y \leq -\frac{1}{2}, y \geq \frac{1}{2}$

37. The area under the curve with parametric equations $x = 1 + t^2, y = t(2 - t)$ in the interval $0 \leq t \leq 1$ is:
A. $\frac{5}{6}$
B. $\frac{6}{5}$
C. $\frac{2}{3}$
D. $\frac{5}{3}$

38. A smooth sphere travelling with a speed of $2m/s$ on a smooth horizontal floor hits a vertical wall at an angle of 45°. Given that the coefficient of restitution is $\frac{1}{4}$, then its speed after impact is:
A. $\frac{1}{4}\sqrt{3}\ m/s$
B. $\frac{3}{4}\sqrt{2}\ m/s$
C. $\sqrt{17}\ m/s$
D. $\frac{1}{4}\sqrt{34}\ m/s$

39. $\frac{5x^3}{(x^2+x+1)(x-2)}$ in partial fractions, where A, B, C and D are real constants is:
A. $\frac{Ax+B}{x^2+x+1} + \frac{C}{x-2}$
B. $\frac{Ax}{x^2+x+1} + \frac{B}{x-2} + D$
C. $\frac{Ax+B}{x^2+x+1} - \frac{C}{x-2}$
D. $\frac{Ax+B}{x^2+x+1} + \frac{C}{x-1} + D$

40. If P= $\begin{pmatrix}1&2&3&4\\3&4&1&2\end{pmatrix}$ and Q= $\begin{pmatrix}1&2&3&4\\2&1&4&3\end{pmatrix}$ are permutations of the elements $(1, 2, 3, 4)$, then QP=
A. $\begin{pmatrix}1&2&3&4\\2&3&4&1\end{pmatrix}$
B. $\begin{pmatrix}1&2&3&4\\4&3&2&1\end{pmatrix}$
C. $\begin{pmatrix}1&2&3&4\\2&3&1&4\end{pmatrix}$
D. $\begin{pmatrix}1&2&3&4\\1&2&3&4\end{pmatrix}$

41. If $\omega = iz$ is a transformation from the z to the ω complex planes, then the invariant point is:
A. 1
B. i
C. 0
D. -1

42. Given that f is the probability density function, where
$$f(x) = \begin{cases} \frac{3x^2}{k}, & 0 \leq x \leq 2 \\ 0, & otherwise \end{cases}$$
the value of k is:
A. 1
B. 2
C. 27
D. 8

43. The series $\sum_{n=1}^{\infty} \left(\frac{5}{2n}\right)^r$ converges when
A. $r < 1$
B. $r = 1$
C. $r = 0$
D. $r > 1$

44. The center of symmetry of the curve $y = \frac{1}{x-2}$ is at the point;
A. (2,0)
B. (0,2)
C. (0,0)
D. $(-2,0)$

45. The particular solution of the differential equation $\frac{d^2y}{dx^2} + 9y = \sin 3x$, where a and b are constants is of the form
A. $y = ax\sin 3x$
B. $y = a\sin x + b\cos x$
C. $y = ax\cos 3x$
D. $y = a\sin 3x + b\cos 3x$

46. The vertices A, B, C of a triangle have the position vectors **a**, **b** and **c** respectively. The area of this triangle is:
A. $|\mathbf{a} \times \mathbf{b}.\mathbf{c}|$
B. $\frac{1}{2}|(\mathbf{b} - \mathbf{a}) \times (\mathbf{c} - \mathbf{b})|$
C. $|(\mathbf{b} - \mathbf{a}) \times (\mathbf{b} - \mathbf{c})|$
D. $\frac{1}{2}|\mathbf{b} \times \mathbf{c}|$

47. If $T = \begin{pmatrix}1&-1\\2&1\end{pmatrix}$, the image of the line $y = -2x$ under T is:
A. $y = 0$
B. $x = 0$
C. $y = \frac{x}{3}$
D. $y = 3x$

48. If the probability density function f of X is
$$f(x) = \begin{cases} \frac{3x^2}{a}, & 0 \leq x \leq a \\ 0, & otherwise \end{cases}$$, then $E(X) =$
A. $\frac{3x^3}{a^3}$
B. $\frac{3a^2}{4}$
C. $\frac{3a}{4}$
D. $\frac{3}{4}$

49. The integrating factor for the differential equation $x\frac{dy}{dx} - y = x$ is:
A. $-x$
B. $\frac{1}{x}$
C. x
D. $-\frac{1}{x}$

50. If a force F acts through a point with position vector **a**, then its moment about a point with position vector **b** is:
A. 0
B. $\mathbf{a} \times \mathbf{F}$
C. $(\mathbf{a} - \mathbf{b}) \times \mathbf{F}$
D. $(\mathbf{b} - \mathbf{a}) \times \mathbf{F}$

END