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 **0765**	PAPER NUMBER **1**
GENERAL CERTIFICATE OF EDUCATION REGIONAL MOCK EXAMINATION	SUBJECT TITLE **PURE MATHEMATICS WITH MECHANICS**	
CANDIDATE NAME: ..... CANDIDATE NUMBER: ..... CENTRE NUMBER:		
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 –0765 code and subject title Pure Mathematics with mechanics 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.**

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1. The polynomial $x^2(x-1)-3(x+2)$ when divided by $(x-2)$ leaves the remainder:
   A -12
   B -8
   C 8
   D 0

2. If the roots of the equation $2x^2-3x-3=0$ are α and β then the value of $\alpha^3\beta+\alpha\beta^3$ is:
   A $-\frac{9}{8}$
   B $-\frac{63}{8}$
   C $\frac{63}{8}$
   D $\frac{9}{8}$

3. Given that $\frac{5x}{(x+2)(x-3)} \equiv \frac{a}{x+2}+\frac{b}{x-3}$, the values of a and b are:
   A $a=2,\ b=3$
   B $a=-2,\ b=3$
   C $a=2,\ b=-3$
   D $a=-2,\ b=-3$

4. Given that the function f is such that $f(-x)=f(x)$, a true statement is:
   A the graph of $y=f(x)$ is symmetrical about the line $y=0$
   B the graph of $y=f(x)$ is symmetrical about the line $y=x$.
   C the graph of $y=f(x)$ is symmetrical about the origin
   D the graph of $y=f(x)$ is symmetrical about the $x=0$

5. $2(3^3)+3^3=$
   A 6^3+3^3
   B 3^9
   C $2(3^6)$
   D 3^4

6. The function $g(x)=x^3+3x^2-9x+10$ is strictly increasing within the range:
   A $]-\infty,\ -3[\cup[1,\ +\infty[$
   B $]-3,\ 1[$
   C $]-\infty,\ -3]\cup]1,\ +\infty[$
   D $[-3,\ 1]$

7. Given the two statements p and q where
   p: Ngwa lives in Douala
   q: Ngwa speaks French
   The proposition "It is not true that Ngwa speaks French and does not live in Douala" in symbolic form is:
   A $q\wedge\sim p$
   B $\sim(\sim q\vee p)$
   C $\sim q\wedge\sim p$
   D $\sim(q\wedge\sim p)$

8. The coefficient of the term in x^4 in the expansion of $\left(x-\frac{2}{x}\right)^{10}$ is:
   A -960
   B -120
   C 120
   D 960

9. The length of the tangent from the point $(-3,-2)$ to the circle $x^2+y^2-4x-2y+1=0$ is:
   A $\sqrt{4}$ units
   B $\sqrt{30}$ units
   C $\sqrt{34}$ units
   D $\sqrt{38}$ units

10. If α is a periodic function with period 4 where $\alpha(x)=\begin{cases}4-x^2, & 0\le x\le 2\\ x-2, & 2\le x\le 4\end{cases}$ then $\alpha(-1)=$:
    A 1
    B 0
    C 3
    D -5

11. The value of m for which the function $h(x)=\begin{cases}2m-x^2, & 0\le x<3\\ 2x-1, & 3\le x\le 5\end{cases}$ is continuous is:
    A 3
    B 4
    C 5
    D 7

12. The value of $(\log_3 32)(\log_4 81)$ is:
    A 20
    B 10
    C $\frac{\log 3}{\log 2}$
    D $(\log 2)(\log 3)$

13. The sum of the first n terms of a sequence is $\frac{n}{2}(3n+1)$. The 10^{th} term of the sequence is:
    A 32
    B 29
    C 126
    D 155

14. The relation R defined on the set $\{1,\ 2,\ 3\}$ as $R=\{(1,1),(2,2),(2,3),(3,2)\}$ is:
    A reflexive
    B transitive
    C symmetric
    D anti-symmetric

15. The number of arrangement of the letters of the word BANANA in which the A's are together is:
    A 60
    B 48
    C 24
    D 12

16. A family consists of a father, mother and four children. The number of ways a friend can invite three members of this family to a party if at least one parent must be invited is:
    A 4
    B 12
    C 16
    D 20

17. An arc of a circle of radius 4cm subtends an angle of $60°$ at the centre of the circle. The length of the arc is:
    A 4.19cm
    B 8.34cm
    C 16.76cm
    D 25.13cm

18. $\frac{\sin 2\theta}{1-\cos 2\theta}=$
    A $\tan\theta$
    B $\cot\theta$
    C $2\tan\theta$
    D $\cos\theta$

19. $\lim_{x\to\infty}\frac{2x^2+3x-200}{3x^2+2x+1}=$
    A $\frac{3}{2}$
    B $\frac{2}{3}$
    C 2
    D 3

20. If $y = \sin x^2$ then $\frac{dy}{dx} =$
A $2x\sin x^2$
B $2x\cos x^2$
C $2\cos x^2$
D $2\sin x^2$

21. The equation of the normal to the curve defined by $x = 3t + 1,\ y = t^2$ at the point where $t = -1$ is:
A $3x - 2y + 8 = 0$
B $2x + 3y + 1 = 0$
C $2x - 3y + 7 = 0$
D $3x + 2y + 4 = 0$

22. Given that $y = c\sqrt{x}$, where c is a constant, the percentage error in the value of y if an error of 2% is made in the measurement of x is:
A 1.5%
B 1%
C 2%
D 2.5%

23. The image of the line $3x - 2y - 6 = 0$ under the transformation represented by matrix $\begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$ is:
A $3x - 4y - 24 = 0$
B $3x + 4y + 18 = 0$
C $4x - 3y - 18 = 0$
D $3x - 4y + 24 = 0$

24. $\int_1^2 \frac{x}{x^2+1} dx =$
A $\frac{1}{2}\ln\left(\frac{2}{5}\right)$
B $\frac{1}{2}\ln\left(\frac{5}{2}\right)$
C $\frac{1}{2}\ln\left(\frac{2}{3}\right)$
D $\frac{1}{2}\ln\left(\frac{3}{2}\right)$

25. The volume of solid generated when the area in the first quadrant bounded by the curve $y = \sqrt{x+2}$, and the lines $x = 0$ and $x = 2$ is rotate completely about the x-axis is:
A 2π
B 4π
C 8π
D 6π

26. The solution of the differential equation $x\frac{dy}{dx} = 3y$ given that $y = 4$ when $x - 1$ is:
A $y = 3\ln x + 4$
B $y = 3\ln x$
C $y = x^3$
D $y = 4x^3$

27. The shortest distance from the point $(1,\ 2)$ to the line $y = 2x + 3$ is:
A $\frac{3}{\sqrt{5}}$ units
B $\frac{3}{5}$ units
C $\frac{7}{\sqrt{5}}$ units
D $\frac{7}{5}$ units

28. The maximum value of the expression $\frac{4}{5-3\cos x}$ is:
A 2
B 4
C 0.5
D 1

29. Expressed in the form $x + iy$, the complex number $4\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$ becomes:
A $2\sqrt{2}(-1 - i)$
B $2\sqrt{2}(1 - i)$
C $2\sqrt{2}(-1 + i)$
D $2\sqrt{2}(1 + i)$

30. Given that the vectors $\mathbf{u}$ and $\mathbf{v}$ are such that $|\mathbf{u}| = 3|\mathbf{v}| = 5$units and that $\mathbf{u} \cdot \mathbf{v} = -1$, the value of $|\mathbf{u} + \mathbf{v}|$ is:
A $\sqrt{62}$units
B $\sqrt{6}$units
C 6units
D 62units

31. When reduced to a linear relationship, the relation $y = ae^{bx}$ becomes:
A $y = ax + b$
B $y = \ln a + bx$
C $\ln y = \ln a + b\ln x$
D $\ln y = \ln a + bx$

32. Given that 3.40 is an approximation to a root of the equation $x^2 - 3x - 2 = 0$, a betttter approximation of this root using Newton-Raphson method is:
A 3.50
B 3.23
C 3.57
D 3.56

33. The cofactor of -3 in the matrix $\begin{pmatrix} 2 & -1 & 0 \\ -2 & 1 & -3 \\ 3 & 4 & -1 \end{pmatrix}$ is:
A 11
B -5
C -11
D 2

34. The range of values of x for which $\frac{3-x}{x+1} > 1$ is
A $x < 1$
B $-1 < x < 1$
C $x < -1 \cup x > 1$
D $-1 < x \cup x > 3$

35. The points P and Q have coordinates $(2, 1, -4)$ and $(-2, 4, -2)$ respectively. The direction ratios of the line passing through P and Q are:
A $\frac{4}{29}, \frac{3}{29}, \frac{2}{29}$
B $\frac{2}{21}, \frac{1}{21}, \frac{4}{21}$
C $\frac{2}{\sqrt{29}}, \frac{3}{\sqrt{29}}, \frac{4}{\sqrt{29}}$
D $\frac{2}{\sqrt{21}}, \frac{1}{\sqrt{21}}, \frac{4}{\sqrt{21}}$

36. A ball is thrown vertically upwards from a point 0.5m above ground level with a speed of 7ms^{-1}. Taking $g = 10\text{ms}^2$, the height above the ground reached by the ball is:
A 2.45m
B 2.95m
C 3.00m
D 3.50m

37. The position vector of a particle of mass 2kg at time t seconds is given by $\mathbf{r} = (3t^2\mathbf{i} + 2t\mathbf{j} + t^3\mathbf{k})$m. The momentum of the particle at time $t = 1$sec is;
A 7Ns
B 14Ns

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C $6\sqrt{2}$Ns
D $12\sqrt{2}$Ns

38. Two forces of magnitudes 10N and 20N act at a point such that the angle between their directions is 60^o. The magnitude of their resultant is:
A $10\sqrt{5+2\sqrt{3}}$N
B $10\sqrt{5}$N
C $10\sqrt{3}$N
D $10\sqrt{7}$N

39. A particle of mass 4kg is attached to an inextensible string and the other end fixed such that the particle hands vertically. The tension in the string when a horizontal force of 30N keeps the system in equilibrium is:
A 50N
B 70N
C 35N
D 45N

40. A ladder of weight 50N leans against a smooth vertical wall with its foot on a rough horizontal floor. If the coefficient of friction between the ladder and the floor is $\frac{\sqrt{3}}{2}$,then the reaction due to the wall is a force of magnitude :
A $25\sqrt{3}$N
B $40\sqrt{3}$N
C $50\sqrt{3}$N
D $100\sqrt{3}$N

41. Two forces $\mathbf{F_1} = (2\mathbf{i} + 3\mathbf{j})$N and $\mathbf{F_2} = (-6\mathbf{i} + 4\mathbf{j})$N act at points with position vectors $\mathbf{r_1} = (-2\mathbf{i} + a\mathbf{j})$m and $\mathbf{r_2} = (2\mathbf{i} + 5\mathbf{j})$m. Given that the forces form a couple of magnitude 26Nm, then the value of the constant a is;
A -3
B -2
C 2
D 3

42. A particle moving in a straight line has an acceleration given by $a = \frac{1}{v}m/s^2$, where v is the velocity of the particle at any time t. Initially, the particle is at rest at a fixed point O. The velocity of the particle when its displacement from O is 9m is:
A $\sqrt[3]{18}ms^{-1}$
B $\sqrt{18}ms^{-1}$
C $9ms^{-1}$
D $3ms^{-1}$

43. Figure 1 is a uniform right angled triangle ABC, with AB = BC = 6cm. N is the midpoint of BC. A circular portion of radius 1cm is removed at N as shown.
The distance of the centre of gravity of the remaining figure from AB is:
A $\frac{36+3\pi}{18+\pi}$
B $\frac{36-3\pi}{18-\pi}$
C $\frac{36-\pi}{18-\pi}$
D $\frac{36+\pi}{18+\pi}$

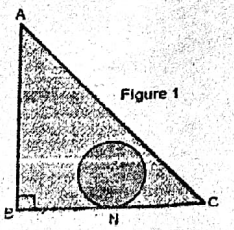

Figure 1

44. A particle of mass 5kg lying on a smooth horizontal table is connected by an inextensible string passing over a smooth fixed pulley at the edge of the table to a particle of mass 7kg which hangs freely. The tension in the string is;:
A 5g
B $\frac{5}{6}g$
C $\frac{35}{2}g$
D $\frac{35}{12}g$

45. A car of mass 5000kg moves up a slope inclined at 30^0 to the horizontal at a steady speed of $10ms^{-1}$. The rate at which the engine is working is;:
A 50kW
B 200kW
C 300kW
D 250kW

46. A particle of mass 2kg moving with an acceleration of $(2\mathbf{i} - 3\mathbf{j} + 2\mathbf{k})ms^2$, moved from the point with position vector $(\mathbf{i} + 2\mathbf{j} - \mathbf{k})$m to the point $(4\mathbf{i} - 3\mathbf{j} + \mathbf{k})$m. The work done by the particle is;:
A 19J
B 25J
C 35J
D 50J

47. Two particles A and B of masses 2m and m, are moving towards each other with speeds $4u$ and $3u$ respectively. If the coefficient of restitution between A and B is $\frac{1}{2}$, then the speed of A after impact is;
A $\frac{7u}{2}$
B $\frac{8u}{2}$
C $\frac{u}{2}$
D $\frac{4u}{2}$

48. A particle is projected from a point O with velocity vector $(13\mathbf{i} + 10\mathbf{j})ms^{-1}$. The maximum height reached by the particle is;:
A $\frac{20}{g}$
B $\frac{50}{g}$
C $\frac{100}{g}$
D $\frac{150}{g}$

49. An elastic string of length $2m$, with obeys Hooke's law extends to $2.5m$ when a force of $10N$ is applied to its. The modulus of elasticity of the string is:
A 40N
B 20N
C 10N
D 8N

50. Two balls are taken at random from a bag containing 4red balls, 4green balls and 3blue balls. The probability that one ball is red and the other is blue is;
A $\frac{4}{11}$
B $\frac{6}{55}$
C $\frac{12}{55}$
D $\frac{28}{55}$

END