SOUTH WEST REGIONAL MOCK EXAMINATION
GENERAL EDUCATION

The Teachers' Resource Unit (TRU) in collaboration with the Regional Pedagogic Inspectorate for Science Education and the South-West Association of Mathematics Teachers (SWAMT)	Subject Code 0765	Paper Number 1
CANDIDATE NAME ..... CANDIDATE NUMBER ..... CENTRE NUMBER	Subject Title PURE MATHEMATICS WITH MECHANICS	
ADVANCED LEVEL	DATE: TUESDAY 28/03/2023-MORNING	

Time Allowed: One hour thirty minutes

INSTRUCTIONS TO CANDIDATES:

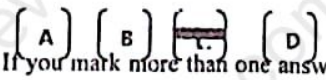
1. USE A SOFT HB PENCIL THROUGHOUT THIS EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

Before the Examination begins:

3. Check that this question booklet is headed "Advanced Level – 0765 Pure Mathematics with Mechanics, Paper 1".
4. Insert the information required in the spaces provided 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:



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. Mobile phones are **NOT ALLOWED** in the examination room.
14. **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. Given that
$L = \sqrt[4]{81} - \sqrt{20} + \sqrt{45} - (-27)^{\frac{1}{3}}$,
the value of L is

A. 11
B. $6 + \sqrt{5}$
C. -11
D. $6 - \sqrt{5}$

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2. The equation $2^{(2x+1)} - 3(2^x) + 1 = 0$ has roots

A. $-1, 0$
B. $\frac{1}{2}, 1$
C. $0, \log 2$
D. $0, 1$

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3. Given that $\log_6 36 - \log_x 9 = 0$, x can take the value(s)

A. -3 *or* 3
B. -6
C. 4.5
D. 3

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4. If $f(x) \equiv 2(x-2)^2 + 7$, then

A. The graph of $y = f(x)$ cuts the $x-$ axis at two points.
B. The graph of $y = f(x)$ has a principal axis where $f(2) = 0$.
C. $f(x) \geq 0$ *and* $f(x)_{max} = 7$
D. $f(x) > 0$ *and* $f(x)_{min} = 7$

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5. Given that $4x^2 - 12x + 9 \equiv P(x+Q)^2 + R$, the values of P, Q and R are, respectively,

A. $4, -\frac{3}{2}, 0$
B. $1, -\frac{3}{2}, \frac{3}{4}$
C. $1, \frac{3}{2}, 0$
D. $4, \frac{3}{2}, \frac{3}{4}$

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6. Given that $\left|\frac{5-x}{x+5}\right| = \frac{5-x}{x+5}$, then

A. $x \leq -5$ *or* $x \geq 5$
B. $-5 < x \leq 5$
C. $-5 < x < 5$
D. $x < -5$ *or* $x > 5$

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7. If $|2x-1| \geq 3$, then

A. $(x \leq -1) \cup (x \geq 2)$
B. $-1 \leq x \leq 2$
C. $(x < -1) \cup (x \geq 2)$
D. $-2 \leq x \leq 1$

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8. When the polynomial $P(x)$ is divided by $x^3 - 2x + 1$, the quotient is $4x^2 + 8$ and the remainder is $-11x^2 + 16x - 9$. $P(x)$ is given as

A. $x^3 - 7x^2 + 14$
B. $4x^5 + 4x^2 + 8$
C. $4x^5 - 7x^2 - 1$
D. $x^3 - 15x^2 + 18$

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9. The graph of $g(x) = ax^3 - 2x + b$ has $y-$intercept 20 and $(x-2)$ is a factor of $g(x)$. The values of a and b are respectively

A. $2, -20$
B. $-2, 20$
C. $\frac{1}{2}, -20$
D. $-\frac{1}{2}, 20$

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10. When θ is small and measured in radians, the expression $\frac{2\theta - sin\theta}{sin2\theta - \theta}$ decomposes to

A. $\frac{1}{2\theta - 1}$
B. $\frac{1}{1-\theta^2}$
C. 1
D. 2

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11. Given that $sin\frac{\pi}{6} = \frac{1}{2}$,
$sin^{-1}(\frac{\sqrt{3}}{2}) - cos^{-1}(\frac{\sqrt{3}}{2}) =$

A. $\frac{\pi}{2}$
B. $\frac{\pi}{3}$
C. $\frac{\pi}{6}$
D. $\frac{\sqrt{3}}{2}\pi$

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12. If $L = \lim_{x \to 1} \frac{1-x^3}{1-x}$, then L has value

A. ∞
B. 3
C. 0
D. 1

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13. Given that $M = \lim_{n \to 0} \frac{e^{3n} - n}{3n}$, then M takes the value

A. 0
B. ∞
C. $\frac{2}{3}$
D. 1

14. Given that $y = 7^{(4x^2-5)}$, the derived coefficient of y with respect to x is given as

A. $8(7^{4x^2-5})$
B. 7^{8x}
C. $8xln7$
D. $8(7^{4x^2-5})xln7$

15. The surface area of a sphere increases from $100\pi\ cm^2$ to $100.4\pi\ cm^2$. Given that the area of a sphere $= 4\pi r^2$, the approximate increase in the radius, r, of the sphere, in cm, is

A. 0.4π
B. 0.01π
C. 0.01
D. 40π

16. The function $\frac{2x^2+1}{16-x^2}$ has asymptotes

A. $x = -4,\ x = 4\ and\ y = -2$
B. $x = -8\ and\ y = 0$
C. $x = -4,\ x = 4\ and\ y = \frac{1}{2}$
D. $x = 8,\ and\ y = \frac{1}{2}$

17. Using the substitution $x = sin^2\theta$ transforms the integral $\int \frac{dx}{x\sqrt{1-x}}$ to the integral with respect to θ of

A. $\frac{2}{sin\theta}$
B. 2
C. $2sin\theta$
D. $cos^2\theta$

18. Given that $\frac{dy}{dt} = 15e^{3t} - 4$ and that $y = 4\ when\ t = 0$, then the function y is expressed as

A. $5e^{3t} - 4t - 9$
B. $5e^{3t} - 4t - 1$
C. $45e^{3t} - 4t - 41$
D. $45e^{3t} - 4t - 49$

19. Two arithmetic means between 9 and 21 are

A. 12, 17
B. 13, 17
C. 14, 16
D. 13, 16

20. The sum of the first n terms of a series is given by $S_n = n(1 + 2n)ln2$. The fifth term of the series is

A. $9ln2$
B. $19ln2$
C. $5ln2$
D. $55ln2$

21. Given that a court room has four access doors, the number of ways a lawyer can enter the court room through one door and leave through another door is

A. 144
B. 16
C. 12
D. 7

22. The number of arrangements of the letters of the word PARALLAX which begin and end with the letter L is

A. 3360
B. 6720
C. 720
D. 120

23. Given that $(-1 + 2x)^4 = 1 - 8x + ax^2 + kx^3 + 16x^4$ the value of k is

A. 24
B. -32
C. -24
D. -3

24. When terms in x^2 and higher powers of x are negligible, the function $(x-2)(1+3x)^8$ is approximately equal to

A. $-2-5x$
B. $-2+x$
C. $-16-40x$
D. $-2-47x$

25. Expressed in the form $a+bi$, where a and b are real numbers, $\frac{2i}{1-i}$ is

A. $1+i$
B. $1-i$
C. $-1+i$
D. $-1-i$

26. Given that $z=-3i+4j$, $\sin(argz)$ *is*

A. $\frac{4}{5}$
B. $\frac{4}{3}$
C. $-\frac{4}{3}$
D. $-\frac{4}{5}$

27. The polynomial equation $x^2+x-6=0$ has a real root in the interval $(-3.3,-2.9)$. Using one iteration of the interval bisection method, a smaller interval which contains the root is

A. $(-3.2,-2.9)$
B. $(-3.1,-2.9)$
C. $(-3,-2.9)$
D. $(-3.1,-3)$

28. A circle touches the $x-axis$ *and* the line $x=7$. Its centre lies on the positive $y-axis$. Then the equation of the circle is

A. $x^2+y^2-14x-49=0$
B. $x^2+y^2-49=0$
C. $x^2+y^2-14x=0$
D. $x^2+y^2-14y=0$

29. Given that two sides of a triangle lie along the lines $x+y-6=0$ and $3x-y-2=0$, one possible vertex of the triangle is the point

A. (4, 2)
B. (2, 4)
C. (4, −2)
D. (2, −4)

30. The distance of the plane $5x+2y-4z=21$ from the origin is

A. $\frac{7\sqrt{5}}{5}$
B. 21
C. $7\sqrt{5}$
D. $\frac{21}{\sqrt{13}}$

31. The scalar (or dot) product of the vectors $2i+j+k$ and $5i+2j-4k$ is

A. −22
B. 8
C. 22
D. −8

32. $R: P \to W$ and $R: x \mapsto x+6$
$P=\{1,2,3,4,5\}$ and $W=\{7,8,9,10,11\}$
Relation R is

A. reflexive
B. injective
C. bijective
D. surjective

33. The negation of the proposition "Joseph always comes to school early." is

A. Joseph never comes to school early.
B. Joseph always comes to school late.
C. Joseph sometimes comes to school early.
D. Joseph sometimes comes to school late.

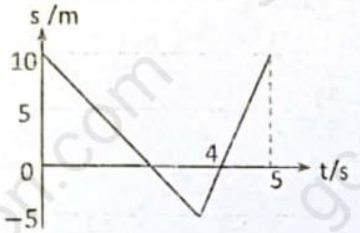
34. The curvilinear relation $y=ax^{-t}$ between x and y, where a and t are real constants, can be linearized in the form

A. $logy=loga-tlogx$
B. $\frac{1}{y}=\frac{1}{a}-t\left(\frac{1}{x}\right)$
C. $logy=alogx-logt$
D. $logy=tlogx-loga$

35. $M = \begin{pmatrix} -2 & 1 & x \\ 3 & 4 & 2 \\ 5 & -1 & 6 \end{pmatrix}$

The cofactor of the entry 4 in matrix M is

A. -8
B. $-(5x + 12)$
C. -23
D. $3x + 4$

36. 

The graph shows the displacement (s)-time (t) graph for a particle moving in a straight line. The average velocity for the interval of time from $t = 0$ to $t = 4$ is

A. $0\ \text{ms}^{-1}$
B. $5\ \text{ms}^{-1}$
C. $2.5\ \text{ms}^{-1}$
D. $4\ \text{ms}^{-1}$

37. The force represented by $(-4\mathbf{i} + 3\mathbf{j})$ acts at the point with position vector $2\mathbf{i} - \mathbf{j}$. The anticlockwise moment of this force about the point with position vector $\mathbf{i} - \mathbf{j}$ is

A. 2 Nm
B. 3 Nm
C. -1 Nm
D. -3 Nm

38. A block of mass 4kg rests on a rough horizontal plane. When a horizontal force of magnitude P N is applied to it, the block is just about to move. If the coefficient of friction between the block and plane is 0.4 then the value of P is

A. 20 N
B. 24 N
C. 12 N
D. 16 N

39. A projectile is given an initial velocity of $3\mathbf{i}+4\mathbf{j}$. The Cartesian equation of its path is

A. $y = 3x - 5x^2$
B. $4y = 3x - 5x^2$
C. $4y = 3x - 20x^2$
D. $y = 4x - 3x^2$

40. A block of mass 3kg falls from rest at a vertical height of 5m above firm ground. The impulse of the force exerted on the ground by the block, given that it does not rebound, is

A. 10 Ns
B. 30 Ns
C. 20 Ns
D. 13 Ns

41. At the beginning of its motion, the position vector of a car is $10(-\mathbf{i} + \mathbf{j})$ and it moves with a constant speed of $10\ \text{ms}^{-1}$ in the direction of the vector $\mathbf{i}$. The path of the car relative to the origin at any time t is

A. $r = 10\mathbf{j}$
B. $r = 10\mathbf{j} - 10\mathbf{i} + 10t\mathbf{i}$
C. $r = 10\mathbf{j} - 10\mathbf{i} + 10t$
D. $r = 10\mathbf{i} + t(-10\mathbf{i} + 10\mathbf{j})$

42. ABC is a uniform right-angled triangular lamina with right angle at A. If AB = 6 cm, AC=12cm and three particles each of weight 2kg are placed at the vertices of the triangle, then the position of the centre of gravity of the lamina, together with the particles from sides AB is

A. 3 cm
B. 2 cm
C. 4 cm
D. 6 cm

43. A particle P starts from rest and moves with a velocity of v given by $v = \frac{2}{s^2}\ \text{ms}^{-1}$, where s is the displacement of the particle at time t. The displacement of P as a function of time t is

A. $s = 6t$
B. $s = 6t^{-3}$
C. $s = 8t^3$
D. $s^3 = 6t$

44. A block of mass 20 kg is pulled across a distance of 8 meters up a plane, inclined at an angle $\arcsin\left(\frac{1}{5}\right)$ to the horizontal. The work done against gravity is

A. 32g J
B. 160g J
C. 160 J
D. 32 J

45. A string of length l has one end fixed to a point A and a particle of mass m kg attached to the other end, travels in a horizontal circle of radius r with center O, vertically below A. The tension in the string is

A. $\frac{mgl}{r}$
B. $\frac{mgr}{l}$
C. mg
D. $\frac{mgl}{\sqrt{l^2-r^2}}$

46. Two particles of masses 3kg and 4kg are connected by a light inextensible string passing over a smooth fixed pulley. The system is released from rest with the string taut and vertical. The acceleration of the system is

A. $\frac{7}{10}\ \text{ms}^{-2}$
B. $10\ \text{ms}^{-2}$
C. $\frac{1}{7}\ \text{ms}^{-2}$
D. $\frac{10}{7}\ \text{ms}^{-2}$

47. A particle of mass 2 kg moves from rest under the action of a constant force of magnitude 5 N which acts for 4 seconds. The maximum power attained in this time is

A. 20 W
B. 50 W
C. 10 W
D. 25 W

48. A particle of mass 3 kg starts at the origin O. Its relative position at any time t seconds with respect to O is $r = 3t^2\mathbf{i} + (8t + 5)\mathbf{j}$. The magnitude of the impulse of the force acting on the particle after a second is

A. 18 Ns
B. 30 Ns
C. $3\sqrt{178}$ Ns
D) 10 Ns

49. An elastic spring of natural length 6 m is compressed to a length of 4 m. The modulus of elasticity of the spring is 60 N. The work done to compress the spring by a further 1 m is

A. 5 J
B. 25 J
C. 45 J
D). 20 J

50. Two dice are thrown. If the it is known that the sum of the numbers on the dice was less than 6, then the probability of obtaining a sum of 3 is

A. $\frac{1}{18}$
B. $\frac{2}{5}$
C. $\frac{5}{18}$
D. $\frac{1}{5}$

END.
GO BACK AND CHECK YOUR WORK