CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

0765 Math with Mechanics 1

JUNE 2016 **ADVANCED LEVEL**

Centre Number	
Centre Name	
Candidate Number	
Candidate Name	

Mobile phones are NOT allowed in the examination room.

MULTIPLE CHOICE QUESTION PAPER

One and a half hours

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

1. USE A SOFT HB PENCIL THROUGHOUT THE 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 Math with Mechanics 1.**
4. Fill in the information required in the spaces above.
5. Fill in the information required in the spaces provided on the answer sheet using your HB pencil: **Candidate Name, Exam Session, Subject Code, Centre Number and Candidate Number.** 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 instruction.
6. ***Answer All questions.***
7. **Mathematical Formulae booklet and calculators are allowed.**
8. Each question has FOUR suggested answers: **A, B, C** and **D**. Decide which answer is appropriate. 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]

9. Mark only one answer for each question. If you mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
10. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
11. Do all rough work in this booklet using the blank spaces in the question booklet.
12. **At the end of the examination, the invigilator shall collect the answer sheet first and then the question booklet. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.**

SECTION A: PURE MATHEMATICS

1. Given that $\frac{2x}{(x-2)(x+4)} \equiv \frac{A}{x-2} + \frac{B}{x+4}$, the values of A and B are respectively
   A $\frac{2}{3}, -\frac{4}{3}$
   B $\frac{2}{3}, \frac{4}{3}$
   C $\frac{3}{2}, -\frac{3}{4}$
   D $-\frac{3}{2}, -\frac{4}{3}$

2. The horizontal asymptote of the curve
$$y = \frac{2x^2 - 3x}{x^2 + x - 2} \text{ is}$$
   A $x = -1$ or $x = 2$
   B $x = 0$ or $x = \frac{3}{2}$
   C $x = 1$ or $x = 2$
   D $x = 1$ or $x = -2$

3. Given that
$g(x) = 3x - 2$, $h(x) = x^2 + 1$, $hg(x) =$
   A $3x^2 + 1$
   B $(3x - 2)(x^2 + 1)$
   C $9x^2 - 12x + 5$
   D $9x^2 + 12x + 5$

4. $\begin{pmatrix} 1 & 2 & 3 \\ 1 & 0 & 2 \\ -1 & 1 & 3 \end{pmatrix}\begin{pmatrix} 1 \\ 2 \\ 0 \end{pmatrix} =$
   A $\begin{pmatrix} 5 \\ -1 \\ 1 \end{pmatrix}$
   B $\begin{pmatrix} 5 \\ 1 \\ 1 \end{pmatrix}$
   C $\begin{pmatrix} 5 \\ 1 \\ -1 \end{pmatrix}$
   D $\begin{pmatrix} 5 \\ 1 \\ 3 \end{pmatrix}$

5. If $2\log_2 x + \log_2 y = 3$ then
   A $xy^2 = 8$
   B $xy = 4$
   C $x^2y = 3$
   D $x^2y = 8$

6. Given that $4^{(2x+1)} = 2^{(x-1)}$, the value of x is
   A -1
   B $-\frac{2}{3}$
   C 1
   D $-\frac{3}{2}$

7. If the quadratic equation
$x^2 + (k-2)x - 2k = 0$
has real and equal roots then
   A $(k-2)^2 = 0$
   B $(k-1)^2 = 0$
   C $(k+2)^2 = 0$
   D $(k+1)^2 = 0$

8. Given that $P(x+2) + Q(x+1) \equiv x$, the values of P and Q respectively are
   A -1 and -2
   B -1 and 2
   C 1 and 2
   D 1 and -2

9. The converse of the statement $p \Rightarrow q$, is represented as
   A $q \Rightarrow p$
   B $\sim p \Rightarrow \sim q$
   C $p \Leftrightarrow q$
   D $\sim q \Rightarrow \sim p$

10. If $A = \{1,2\}$ and $B = \{3,4\}$ then the Cartesian product $A \times B$ is
   A $\{3,4,6,8\}$
   B $\{(1,3),(1,4),(2,3),(2,4)\}$
   C $\{(3,1),(4,1),(3,2),(4,2)\}$
   D $\{4,5,5,6\}$

11. $\lim_{x \to 3} \frac{1}{2} =$
   A $\frac{1}{\sqrt{3}}$
   B $\frac{\sqrt{3}}{2}$
   C $\frac{1}{2}$
   D 0

12. The derivative of $\cos(1-x)$ with respect to x is
   A $-\sin(1-x)$
   B $\sin(1-x)$
   C $-(1-x)\sin(1-x)$
   D $\sin(1+x)$

13. $\int \frac{1}{x+4} dx =$

A $\tan^{-1}\frac{x}{2} + k$

B $\frac{1}{2}\tan^{-1}\frac{x}{2} + k$

C $\ln(x + 4)$

D $\ln(x + 4) + k$

14. If a complex number z has modulus 2 and argument $\frac{\pi}{6}$, then

A $z = 1 + \sqrt{3}\,i$

B $z = \sqrt{3} - i$

C $z = \sqrt{3} + i$

D $z = 1 - \sqrt{3}\,i$

15. $e^{-\frac{\pi}{2}i} =$

A $\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$

B $-\cos\frac{\pi}{2} - i\sin\frac{\pi}{2}$

C $\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$

D $\frac{1}{2}[\cos(-\pi) - i\sin(-\pi)]$

16. The relationship between two variables x and y produces values as shown in the table below.

x	0	1	2	3	4
y	3	5	6	m	3

If by applying the trapezium rule $\int_0^4 y\,dx \approx 18$, the value of m is

A 7

B 4

C 8

D 19

17. A root of the equation $x^3 - 5x - 3 = 0$ lies in the open interval

A (0, 1)

B (1, 2)

C (2, 3)

D (3, 4)

18. The solution of the differential equation

$$(1 + x^2)\frac{dy}{dx} = 1$$

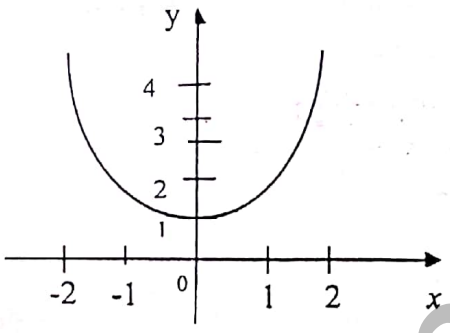
A $\tan^{-1}\left(\frac{x}{2}\right) + k$

B $\tan^{-1}(x) + k$

C $\cot^{-1}\left(\frac{x}{2}\right) + k$

D $\cot^{-1}(x) + k$

19.



The figure above represents the graph of

A $y = x^2$

B $y = x^2 - 1$

C $y = x^2 + 1$

D $y = x + 1$

20 Given that $\mathbf{r}_1 = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k} + \lambda(4\mathbf{i} - \mathbf{j} + m\mathbf{k})$ and $\mathbf{r}_2 = 3\mathbf{i} + 2\mathbf{j} - \mathbf{k} + \mu(\mathbf{i} + \mathbf{j} - \mathbf{k})$ are two perpendicular lines, the value of m is

A 3

B −3

C 1

D −1

21. The solution set of the inequality $|5x - 3| < 2$ is

A $\frac{1}{5} < x < 1$

B $-\frac{1}{5} < x < 2$

C $-\frac{1}{5} < x < 1$

D $-1 < x < \frac{1}{5}$

22. Given that $\sqrt{3}\cos x + \sin x \equiv R\cos(x - \theta)$, where $R > 0$ and $0 < \theta < \frac{\pi}{2}$, the values of R and $\tan\theta$ respectively are;

A $\sqrt{3}$, $\sqrt{3}$

B $4, -\frac{1}{\sqrt{3}}$

C $2, \frac{1}{\sqrt{3}}$

D $3, -\sqrt{3}$

23. A circle of centre (2, 3) touches the x-axis at (2,0).The equation of the circle is.

A $(x + 2)^2 + (y + 3)^2 = 9$

B $(x + 2)^2 + (y + 3)^2 = 4$

C $(x - 2)^2 + (y - 3)^2 = 4$

D $(x - 2)^2 + (y - 3)^2 = 9$

24. The general solution of the equation $\cos\theta = \frac{1}{2}$ is

A $\theta = 2n\pi \pm \frac{\pi}{3}$
B $\theta = 2n\pi \pm \frac{\pi}{6}$
C $\theta = n\pi \pm \frac{\pi}{3}$
D $\theta = n\pi \pm \frac{\pi}{6}$

25. X and Y are two variables related by the equation $Y = aX^n$ where a and n are constant. A suitable linear transformation for this non-linear equation is

A $\ln Y = n\ln X + \ln a$
B $\ln Y = n\ln a + \ln X$
C $\ln X = n\ln Y + a$
D $\ln X = n\ln a + y$

26. An equivalence relation is one that is

A reflexive, symmetric and commutative,
B reflexive, symmetric and identical,
C reflexive, anti-symmetric and transitive,
D reflexive, symmetric and transitive.

27. The parametric equations of a curve are $x = 2t,\ y = 4t^2 - 1$.
The Cartesian equation of the curve is

A $y = x^2 - 1$
B $y = (x-1)^2$
C $y - 1 = 2x^2$
D $y = 4x^2 - 1$

28. The coefficient of x^2 in the binomial expansion of $(2-4x)^4$ is

A 64
B −384
C 384
D -64

29. The number of ways the letters of the word *STANDARDS* can be arranged is

A $\frac{9!}{2!\,2!\,2!}$
B $\frac{9!}{2!}$
C $\frac{9!}{2!2!}$
D $\frac{9!}{6!}$

30. $\cos 7\theta + i\sin 7\theta \equiv$

A $7(\cos\theta + i\sin\theta)$
B $7(\cos\theta - i\sin\theta)$
C $(\cos\theta + i\sin\theta)^7$
D $\cos 2\theta\cos 5\theta + i\sin 2\theta\sin 5\theta$

31. Given that $(x+1)$ is factor of the polynomial $P(x) = x^3 - x^2 - x - m$.
The value of m is

A 1
B −1
C 0
D −4

32. $\sum_{r=1}^{20}(r+1) =$

A 210
B 320
C 230
D 302

33. The distance of the plane $2x - 2y - z = 27$ from the origin is

A 9
B 3
C 27
D 6

34. A periodic function f of period 4 is defined as follows:

$$f(x) = \begin{cases} 1 - x^2, & 0 \le x < 2 \\ 2x - 5, & 2 \le x < 4 \end{cases}$$

The value of f(11) is

A 1
B −1
C 17
D −120

35. The sum of the roots of the equation $3x^2 + kx - 15 = 0$ is 2.
The value of the constant k is

A 6
B −6
C 30
D −30

SECTION B: MECHANICS

36. The magnitude of the resultant of the forces $\mathbf{F_1} = (-5\mathbf{i} + 12\mathbf{j})$ N, $\mathbf{F_2} = (-18\mathbf{i} - 8\mathbf{j})$ N, $\mathbf{F_3} = (4\mathbf{i} + 9\mathbf{j})$ N and $\mathbf{F_4} = (4\mathbf{i} - 5\mathbf{j})$ N is
A -7 N
B 17 N
C 7 N
D -17 N

37. An elastic string, of natural length 3 m and modulus 12 N, has been extended to a length of 4 m. The elastic energy stored in the string is
A 2 J
B 32 J
C 4 J
D 64 J

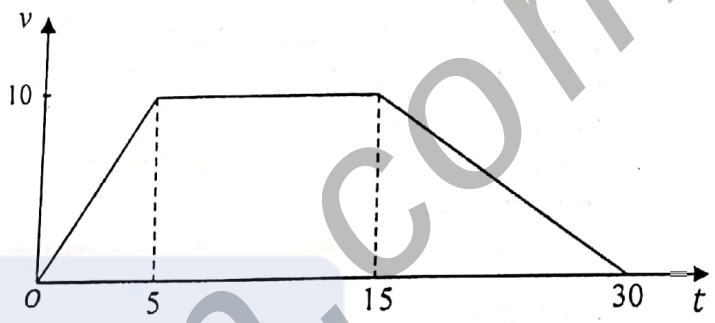
38. A particle accelerating from rest has its speed v ms^{-1} at time t s given by
$$v = 6t - \frac{1}{2}t^2.$$
The acceleration of the particle when $v = 10$ is
A 4 ms^{-2}
B 10 ms^{-2}
C 2 ms^{-2}
D 1 ms^{-2}

39. Two particles A and B have velocities $\mathbf{V_A} = (2\mathbf{i} - 6\mathbf{k})$ ms^{-1} and $\mathbf{V_B} = (-3\mathbf{i} + 2\mathbf{j})$ ms^{-1} respectively. The velocity of B relative to A is
A $(-5\mathbf{i} - 4\mathbf{j})$ ms^{-1}
B $(-5\mathbf{i} - 8\mathbf{j})$ ms^{-1}
C $(-5\mathbf{i} + 2\mathbf{j} + 6\mathbf{k})$ ms^{-1}
D $(5\mathbf{i} + 2\mathbf{j} - 6\mathbf{k})$ ms^{-1}

40. A small smooth sphere A, of mass 5 kg, is moving with speed 4 ms^{-1}. Another small smooth sphere B, of mass 2 kg, is moving with speed 3 ms^{-1} in the opposite direction and on the same straight line. If the spheres collide and coalesce, their common speed after collision is
A 14 ms^{-1}
B $\frac{26}{7}$ ms^{-1}
C 2 ms^{-1}
D 7 ms^{-1}

41. A car which is driven by a force of magnitude 5,400 N against a resistance of magnitude 1,200 N is accelerating at 4.2 ms^{-2}. The mass of the car is
A 17,640 kg
B 1,000 kg
C 1,285.7 kg
D 4,200 kg

42. The diagram shows the speed-time graph of a car.



The acceleration of the car after 2 s and the total distance covered by the car are respectively
A 2 ms^{-2} and 275 m
B 2 ms^{-2} and 250 m
C 4 ms^{-2} and 200 m
D 2 ms^{-2} and 200 m

43. A force $\mathbf{F} = (3\mathbf{i} + \mathbf{j})$ N acts through the point with position vector $\mathbf{r} = (\mathbf{i} - 5\mathbf{j})$ m. The moment of F about the point (2, 3) is
A 16 Nm
B 7 Nm
C 25 Nm
D 23 Nm

44. Three forces with magnitudes 24 N, F_1 N and F_2 N act on a particle. The forces are such that F_1 N force is horizontal, the 24 N force is acting vertically downwards and the angle between the F_2 N force and the F_1 N force is 120°. If the system is in equilibrium, the value of F_1 is
A $10\sqrt{3}$ N
B $12\sqrt{3}$ N
C $8\sqrt{3}$ N
D $13\sqrt{3}$ N

45. The power exerted by a force $\mathbf{F} = (3t^2\mathbf{i} + 2t\mathbf{j})$ N on a particle with velocity $\mathbf{v} = (3t\,\mathbf{i} - 2t^2\,\mathbf{j})$ ms^{-1} at time $t = 2$ s is

A 40 W

B 72 W

C $(18\mathbf{i} - 4\mathbf{j})$ W

D 104 W

---

46. A particle is projected from a point on a horizontal plane with speed 40 ms^{-1} at an angle of elevation 30°. The horizontal range of the particle is

A 80 m

B $80\sqrt{3}$ m

C $2\sqrt{3}$ m

D $160\sqrt{3}$ m

---

47. The points A and B have position vectors $(\mathbf{i} - \mathbf{j} + \mathbf{k})$ m and $(2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k})$ m respectively. The work done by a force $\mathbf{F} = (3\mathbf{i} + 4\mathbf{j} + 5\mathbf{k})$ N which moves its point of application from A to B is

A −18 J

B 18 J

C 10 J

D −10 J

---

48. A and B are independent events such that $P(A) = \frac{1}{3}$ and $P(A \cup B) = \frac{2}{3}$, $P(B) =$

A $\frac{1}{3}$

B $\frac{2}{5}$

C $\frac{1}{2}$

D $\frac{3}{4}$

---

49. The probability of drawing a spade from a pack of cards is $\frac{1}{4}$, the probability of drawing an ace from the same pack is $\frac{1}{13}$. The probability of drawing a spade or an ace from the pack is

A $\frac{17}{52}$

B $\frac{16}{52}$

C $\frac{1}{52}$

D $\frac{51}{52}$.

---

50. A car accelerates from 12 ms^{-1} to 18 ms^{-1} in 4 s. The distance covered by the car in this time is

A 120 m

B 24 m

C 1.5 m

D 60 m

STOP

GO BACK AND CHECK YOUR WORK