CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD
General Certificate of Education Examination

0775 Further Mathematics 1

JUNE 2020

ADVANCED LEVEL

Centre Number	
Centre Name	
Candidate Identification No.	
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 – 0775 Further Mathematics 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 and Candidate Identification 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 instructions.

How to answer the questions in this examination

6. Answer **ALL** the **50** questions in this Examination. All questions carry equal marks.
7. 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 bracket 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 LEAVET THE EXAMINATION HALL WITH IT.**

Turn over

1. The integrating factor of the differential equation

$$\frac{dy}{dx} + \frac{y}{2x} = \frac{e^x}{\sqrt{x}},\ x \neq 0, \text{ is}$$

A $\frac{1}{2}x$
B x^2
C $x^{\frac{1}{2}}$
D $2x$

---

2. $\frac{1}{e^{2i\theta}} \equiv$

A $e^{-2}(\cos\theta + i\sin\theta)$
B $e(\cos 2\theta + i\sin 2\theta)$
C $\cos 2\theta - i\sin 2\theta$
D $e^{-2}(\cos\theta - i\sin\theta)$

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3. The expression $\frac{x^2}{(x^2+2)^2}$ in partial fractions, where P, Q, R, S are real constants, is

A $\frac{P}{x^2+2} + \frac{Q}{(x^2+2)^2}$

B $\frac{Px+Q}{x^2+2} + \frac{Rx+S}{(x^2+2)^2}$

C $\frac{Px+Q}{x^2+2} + \frac{Rx^2+S}{(x^2+2)^2}$

D $\frac{P}{x^2+2} + \frac{Qx+R}{(x^2+2)^2}$

---

4. The series $\sum_{r=1}^{\infty} r^{-\frac{k}{2}}$ is divergent for

A $k > 1$
B $k \geq 2$
C $k \leq 2$
D $0 < k \leq 2$

5. The image of the vector $\mathbf{i} + \mathbf{j} - 2\mathbf{k}$ under a mapping defined by the matrix M, where $M = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 2 & 3 & 1 \end{pmatrix}$ is

A $-3\mathbf{i} - 3\mathbf{j} + 3\mathbf{k}$
B $3\mathbf{i} + 3\mathbf{j} + 3\mathbf{k}$
C $-3\mathbf{i} + 3\mathbf{j} + 3\mathbf{k}$
D $3\mathbf{i} - 3\mathbf{j} - 3\mathbf{k}$

---

6. The curve C has parametric equations

$x = a(t - \sin t),\ y = a(1 - \cos t),\ a > 0,\ 0 \leq t \leq 2\pi$.

The area of the region bounded by the curve and the x-axis is $3\pi a^2$. The mean value of y with respect to x for $0 \leq t \leq 2\pi$ is

A $\frac{3a^2}{2}$
B $\frac{3a}{2}$
C $\frac{3}{2}$
D $\frac{3\sqrt{a}}{2}$

---

7. A tangent at the pole to the polar curve $r = \sqrt{2} - 2\cos\theta$ is $\theta =$

A $\frac{\pi}{6}$
B $\frac{\pi}{4}$
C $\frac{\pi}{3}$
D $\frac{\pi}{2}$

---

8. Which one of the following conics is a parabola?

A $x^2 + y + 5 = 4x$
B $2x^2 + y^2 = 4x + 4$
C $4x^2 - 9y^2 + 32x - 144y = 548$
D $25(x+2)^2 - 36(y-1)^2 = 900$

---

9. If the series $\sum_{r=1}^{\infty} \frac{3}{r^{k+1}}$ converges, then

A $k > -1$
B $k > 0$
C $k > 2$
D $k > 3$

---

10. Given the group $(S = \{a, b, c, d\}, \otimes)$

$\otimes$	a	b	c	d
a	d	c	b	a
b	c	d	a	b
c	b	a	d	c
d	a	b	c	d

The inverse of an element $x,\ x \in S$ is

A x
B d
C c
D b

11. A continuous random variable X has a probability density function f, where

$$f(x) = \begin{cases} k(1-x^2) & 0 \le x \le 1 \\ 0 & \text{elsewhere} \end{cases}.$$

The cumulative probability function $F(x) =$

A $\begin{cases} 0, & x < 0 \\ k(1-x^2), & 0 < x \le 1 \\ 1, & x > 1 \end{cases}$

B $\begin{cases} k(x - \frac{x^3}{3}), & 0 < x \le 1 \\ 0, & \text{elsewhere} \end{cases}$

C $\begin{cases} 0, & x < 0 \\ k(x - \frac{x^3}{3}), & 0 < x \le 1 \\ 1, & x > 1 \end{cases}$

D $\begin{cases} 0, & x < 0 \\ k(x - \frac{x^3}{3}), & 0 < x \le 1 \\ 0, & x > 1 \end{cases}$

12. A particle of mass m falls against a resistance of magnitude kv ,where vis the velocity and k is a positive constant. The equation of motion is given by

A $\frac{dv}{dt} = -mkv$

B $\frac{dv}{dt} = mg - kv$

C $\frac{dv}{dt} = mg + kv$

D $\frac{dv}{dt} = -mg - kv$

13. If x is the displacement of a particle from a fixed point O at time t, then which of the following represents oscillatory motion?

A $\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 4x = 0$

B $\frac{d^2x}{dt^2} - 4\frac{dx}{dt} - 5x = 0$

C $\frac{d^2x}{dt^2} + 4x = 0$

D $\frac{d^2x}{dt^2} - 4x = 0$

14. If $f(x) = 2 + x^2 - x^3$, then the equation $f(x) = 0$ has a solution on the interval

A $[1,2]$

B $[0,1]$

C $[-1,0]$

D $[-2,-1]$

15. Given that $f(x) = \begin{cases} \frac{2\sin(\frac{x}{2})}{x}, & x \ne 0 \\ k, & x = 0 \end{cases}$

is a continuous function at $x = 0$, the value of k is

A 0

B $\frac{1}{2}$

C 1

D 2

16. A force $\mathbf{F} = (3\mathbf{i} - \mathbf{j} + 2\mathbf{k})N$ acts on a particle giving it a displacement of $(3\mathbf{i} + 4\mathbf{k})\mathrm{m}$. The work done by $\mathbf{F}$ is

A 15 J

B $5\sqrt{14}$ J

C 5 J

D 17 J

17. The centre of symmetry of the curve $y = \frac{2x}{x^2 - 4}$, $x \ne \pm 2$ is

A $(0,2)$

B $(2,0)$

C $(0,0)$

D $(-2,1)$

18. Given the truth table of a conjunction, then the values of a and b respectively are:

P	Q	P ∧ Q
T	T	T
T	F	a
F	T	F
F	F	b

A F,T

B T,F

C T,T

D F,F

19. If two elastic spheres collide and the total mechanical energy remains constant, then the value of the coefficient of restitution e is

A $0 < e \leq 1$
B $0 \leq e < 1$
C $e = 0$
D $e = 1$

---

20. $\int_0^4 [x]dx =$, where $[x]$ is the greatest integer function of x

A 0
B 4
C 6
D 8

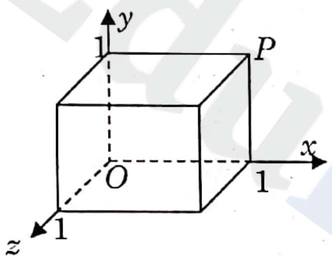
---

21. The number of solution(s) of the equation $3\cosh(2x-1) = 3$ is

A 0
B 1
C 2
D 3

---

22. The coordinates of the point P on the unit cube is



A (1,1,0)
B (0,1,1)
C (1,0,1)
D (1,1,1)

---

23. Given that $f(x) = \begin{cases} 2\cosh x, & x < 0 \\ \sinh x, & x \geq 0. \end{cases}$

Then the $\lim_{x \to 0} f(x)$

A does not exist
B is 2
C is 1
D is 0

---

24. The depth of the cross-section of a river flowing at 2 m/s from riverbank to bank measures

distance across, x	0	1	2
depth, y	0.5	1.2	0.4

A Simpson's rule approximation of the volume of water released each second is

A 7.6 m^3/s
B 3.8 m^3/s
C 4.0 m^3/s
D 2.5 m^3/s

---

25. A parabola is the locus of a point equidistant from

A two fixed lines
B two fixed points
C a fixed point and a fixed line
D two fixed perpendicular lines

---

26. If $\cosh 2x = \frac{5}{4}$ then the positive value of $\sinh 2x$ is

A $\frac{4}{5}$
B $\frac{3}{2}$
C $\frac{3}{4}$
D $\frac{4}{3}$

---

27. A medical treatment has a success rate of 90%. Two patients are administered the treatment independently. The probability that neither of them gets well is

A 0.90
B 0.81
C 0.10
D 0.01

---

28. The moment of inertia of a body of mass $3m$ about an axis is $9ma^2$. The radius of gyration of the body about the given axis is

A $3a$
B $a\sqrt{3}$
C $\frac{1}{3}a$
D $a\frac{\sqrt{3}}{3}$

29. The unit digit of the number $19^{2004} + 11^{2004} - 9^{2004}$ is

A 1
B 3
C 7
D 9

30. The vertices A, B,C of ΔABC have position vectors $\mathbf{a}, \mathbf{b}, \mathbf{c}$ respectively. The area of ΔABC is

A $\frac{1}{2}|\mathbf{a} \times \mathbf{b}|$

B $\frac{1}{2}|\mathbf{a} \times \mathbf{c}|$

C $\frac{1}{2}|\mathbf{a} \times \mathbf{b} \times \mathbf{c}|$

D $\frac{1}{2}|(\mathbf{a} - \mathbf{b}) \times (\mathbf{b} - \mathbf{c})|$

---

31. A particle is moving round the polar curve $r = 1 + \sin\theta$ with constant angular velocity w. The maximum speed of the particle is

A w

B $w\sqrt{2}$

C $w / 2$

D $2w$

---

32. If the function $f(x) = \begin{cases} \dfrac{x^2 - 1}{x + 1}, & x \neq -1 \\ k & x = -1 \end{cases}$

is continuous on $\mathbb{R}$, then $k =$

A -2

B -1

C 0

D 1

---

33. If $z = \left[i\left(\cos\theta + i\sin\theta\right)\right]^n$ then $\arg(z) =$

A $-2n\theta + n\frac{\pi}{2}$

B $n\theta + n\frac{\pi}{2}$

C $2n\theta$

D $2n\theta - n\frac{\pi}{2}$

---

34. The particular integral of the differential equation

$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x}$ is

A λe^{2x}

B $\lambda x e^{2x}$

C $\lambda x^2 e^{2x}$

D $2\lambda x e^{2x}$

---

35. Given that $f(x)$ is a continuous even function, then

$\int_{-a}^{a} f(x)dx =$

A 0

B $2\int_0^a f(x)dx$

C $2\int_{-a}^{a} f(x)dx$

D $\int_0^a f(x)dx$

---

36. Given that $\frac{dy}{dx} + 2y = 0$ and $y = 1$ when $x = 0$. A quadratic approximation for y is

A $1 - 2x - 2x^2$

B $1 - 2x + 2x^2$

C $1 - 2x + x^2$

D $1 - 2x + \frac{1}{2}x^2$

---

37. The function f has a removable discontinuity at x_0. Therefore

A $f(x_0)$ exists

B $\lim_{x \to x_0} f(x)$ exists

C $\lim_{x \to x_0} f(x) = f(x_0)$

D $\lim_{x \to x_0} f(x)$ does not exist

---

38. If $x > 0$, then $\frac{d}{dx}(\ln\sinh 2x) =$

A $\coth 2x$

B $2\coth 2x$

C $2\tanh 2x$

D $\tanh 2x$

---

39. $\frac{x^2}{x^2-1}$ expressed in partial fractions, where $P, Q,$ and R, are real constants, with $x \neq \pm 1$, is

A $\frac{P}{x+1}+\frac{Q}{x-1}$

B $P+\frac{Q}{x+1}+\frac{R}{x-1}$

C $\frac{P}{x-1}+\frac{Q}{(x-1)^2}$

D $P+\frac{Q}{x+1}+\frac{R}{(x-1)^2}$

40. A particle is executing simple harmonic motion with amplitude 2 meters and period 12 seconds. What is the maximum speed in m/s of the particle?

A $\frac{\pi}{6}$

B $\frac{\pi}{3}$

C $\frac{\pi^2}{36}$

D $\frac{\pi^2}{3}$

41. Which one the following linear Diophantine equations has positive solutions?

A $x+5y=7$

B $x+5y=3$

C $x+5y=2$

D $x+5y=1$

42. A force $\mathbf{F}=(2\mathbf{i}+4\mathbf{j}-\mathbf{k})N$, displaces a particle through $(12\mathbf{i}+4\mathbf{j}+2\mathbf{k})m$. The work done by the force is

A 23 J

B 38 J

C 48 J

D $\sqrt{21}\times\sqrt{164}$ J

43. If $|x|>2$, then $\int\frac{1}{\sqrt{x^2-4}}dx=$

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

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

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

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

44. The furthest point from the pole to the polar curve $r=2+\sqrt{2}\sin\theta$ occurs when $\theta=$

A $-\frac{\pi}{2}$

B 0

C $\frac{\pi}{2}$

D π

45. A point P traces the curve $r=a\theta$, O the pole such that OP moves with constant angular velocity w. The radial component of acceleration when P is at the point (r,θ) is

A $-rw^2$

B rw^2

C $-2aw^2$

D $2aw^2$

46. If $f(x)=2x+|x-2|-|x|$ and $0\le x<2$, then $f(x)=$

A 2

B $2+4x$

C $2-4x$

D $-2+2x$

47. The component of the force $(3\mathbf{i}-\mathbf{j}+2\mathbf{k})N$ in the direction the vector $(-4\mathbf{j}+3\mathbf{k})$ is

A 10

B 9

C 9/5

D 2

48. The area of a square, $A(t)$, is increasing at a rate equal to its perimeter. $A(t)$ satisfies the differential equation $\frac{dA}{dt}=$

A $4A$

B $2A$

C $-4\sqrt{A}$

D $4\sqrt{A}$

49. Given that the moment of inertia of a rod of mass m and length $2l$ about an axis through its centre perpendicular to the rod is I, then the moment of inertia about a perpendicular axis on the rod distant x from the centre is

A $I - mx^2$

B $I + mx^2$

C $\frac{4}{3}ml^2 + mx^2$

D $\frac{1}{3}I + mx^2$

50. How many proper subgroups are there in a cyclic group of order 12?

A 4

B 3

C 2

D 1

STOP

GO BACK AND CHECK YOUR WORK