CAMEROON GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

0775 Further Mathematics 1

JUNE 2019 **ADVANCED LEVEL**

Centre Number	
Centre Name	
Candidate Identification 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 – 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 Cod 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.**

1. The integrating factor for the differential equation $\frac{dy}{dx} - \frac{1}{x-1}y = e^x, x \neq 1$, is

A e^{x-1}

B e^x

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

D $x-1$

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

A $\cos 2\theta + i\sin 2\theta$

B $\frac{1}{2}(\cos\theta + i\sin\theta)$

C $\frac{1}{2}(\cos\theta - i\sin\theta)$

D $\cos 2\theta - i\sin 2\theta$

3. $\frac{x}{(x+1)(x^2-1)}$ can be expressed in partial fractions, p,q,r being constants, with $x \neq \pm 1$, as

A $\frac{p}{x+1} + \frac{qx+r}{x^2-1}$

B $\frac{p}{x+1} + \frac{q}{x-1} + \frac{r}{(x-1)^2}$

C $\frac{p}{x+1} + \frac{q}{(x+1)^2} + \frac{r}{(x-1)}$

D $\frac{p}{x+1} + \frac{q}{(x-1)} + \frac{r}{(x^2+1)}$

4. Which one of the sequences below is divergent?

A $\left\{\frac{2n^2}{3n+17}\right\}_{n=1}^{\infty}$

B $\left\{\frac{2n}{3n^2+5}\right\}_{n=1}^{\infty}$

C $\left\{\frac{2n}{n^2+n+1}\right\}_{n=1}^{\infty}$

D $\left\{2^{-n}\right\}_{n=1}^{\infty}$

5. Which one of the following sets of vectors is a basis for $\mathbb{R}^2$

A $\left\{\begin{pmatrix}1\\-2\end{pmatrix}, \begin{pmatrix}-3\\6\end{pmatrix}\right\}$

B $\left\{\begin{pmatrix}1\\1\end{pmatrix}, \begin{pmatrix}2\\2\end{pmatrix}\right\}$

C $\left\{\begin{pmatrix}2\\1\end{pmatrix}, \begin{pmatrix}0\\1\end{pmatrix}\right\}$

D $\left\{\begin{pmatrix}1\\2\end{pmatrix}, \begin{pmatrix}4\\8\end{pmatrix}\right\}$

6. The mean value of $\tan x$ over the interval $0 \leq x \leq \frac{\pi}{3}$ is

A $\ln 2$

B $\frac{\pi}{6}\ln 2$

C $\frac{6}{\pi}\ln 2$

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

7. The polar equation of the curve $x^2 + y^2 = 2x$ is

A $r = 2\cos\theta$

B $r = \sin 2\theta$

C $r = 2\sin\theta$

D $r = \cos\theta$

8. The distance between the planes $2x - y - 2z = 5$ and $2x - y - 2z = 7$ is

A $\frac{2}{9}$

B $\frac{2}{3}$

C 2

D 4

9. Given a sequence $(u_n)_{n\geq 1}$. Which one of the following statements is true?

A If $(u_n)_{n\geq 1}$ is bounded then it converges

B If $(u_n)_{n\geq 1}$ converges then it is bounded

C $(u_n)_{n\geq 1}$ is bounded if and only if it converges

D If $(u_n)_{n\geq 1}$ has a limit then it converges

10. The inverse of the permutation $p = \begin{pmatrix}1 & 2 & 3 & 4\\4 & 3 & 1 & 2\end{pmatrix}$ is

A $\begin{pmatrix}1 & 2 & 3 & 4\\1 & 3 & 2 & 4\end{pmatrix}$

B $\begin{pmatrix}1 & 2 & 3 & 4\\3 & 2 & 4 & 1\end{pmatrix}$

C $\begin{pmatrix}1 & 2 & 3 & 4\\3 & 4 & 2 & 1\end{pmatrix}$

D $\begin{pmatrix}1 & 2 & 3 & 4\\2 & 3 & 1 & 4\end{pmatrix}$

11. Which probability distribution model is best suited for modelling the scores in an examination?
   A Binomial
   B Geometric
   C Poisson
   D Normal

12. A particle of mass m falls against a resistance, per unit mass, proportional to its velocity v. Given that $k > 0$, the terminal velocity is
   A kv
   B $\frac{k}{g}$
   C $\frac{g}{k}$
   D kg

13. The equation of motion of a particle moving on the $x-$axis is satisfied by $\frac{d^2x}{dt^2} + 4x = 0$. The period of the motion is
   A π
   B 2π
   C $\frac{\pi}{2}$
   D $\frac{\pi}{4}$

14. If $f(x) = 1 - x^2 + x^3$, then the equation $f(x) = 0$ has a solution on the interval
   A $[-2,-1]$
   B $[-1,0]$
   C $[0,1]$
   D $[1,2]$

15. If $x \neq -1$, $x \neq 0$ and f is function such that $\frac{e^{-x}}{1+x} \leq f(x) \leq \frac{\ln x}{x}$., then $\lim_{x\to+\infty} f(x) =$
   A $-\infty$
   B 0
   C 1
   D $+\infty$

16. If $(2\mathbf{i} + \lambda\mathbf{j}) \times (\mathbf{i} + \mathbf{j} - \mathbf{k}) = -\lambda\mathbf{i} + 2\mathbf{j} - \mathbf{k}$ then $\lambda =$
   A -3
   B -2
   C 2
   D 3

17. Given that the line $y = x - b$ is an asymptote to the curve $y = \frac{x^2 - ax}{x - 1}$, $a, b \in \mathbb{R}, x \neq 1$, then $b =$
   A $-1 - a$
   B $1 - a$
   C $a + a$
   D $-1 + a$

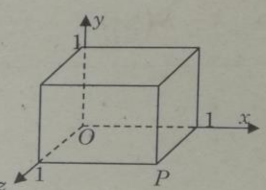
18. The contrapositive of the statement $\sim p \Rightarrow q$ is
   A $\sim p \Rightarrow q$
   B $\sim q \Rightarrow p$
   C $\sim p \Rightarrow \sim q$
   D $q \Rightarrow \sim p$

19. The velocities of a sphere before and after impact are $(-10\mathbf{i} + 4\mathbf{j} - 3\mathbf{k})$ and $(-\mathbf{i} - \mathbf{j} + \lambda\mathbf{k})$ respectively. Given that the sphere is deflected through a right angle, the value of λ is
   A 2
   B 1
   C -1
   D -2

20. $\int_{-1}^{1} e^{|x|}dx =$
   A 0
   B $2\int_0^1 e^x dx$
   C $2\int_{-1}^1 e^x dx$
   D $\int_0^1 e^x\, dx.$

21. The maximum value of $\frac{2}{3\cosh 2x + 2}$ is
   A 2
   B 5
   C $\frac{2}{5}$
   D ∞

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. A function, f ,is given by $f(x) = \begin{cases} \dfrac{\sin x}{x}, & x < 0 \\ x^2 + 1, & x \geq 0 \end{cases}$

The function f
- A is continuous at $x = 0$
- B has a removable discontinuity
- C is undefined at $x = 0$
- D has no limit as $x \to 0$

24. Given that $\dfrac{dy}{dx} = x - y,\ x = 1,\ y = 1.1$. Using the approximation $0.1\left(\dfrac{dy}{dx}\right) \cong y_{n+1} - y_n$, the value of y when $x = 1.1$ is
- A 1.09
- B 1.00
- C 1.10
- D 1.20

25. Let e, f, g be the eccentricity of a hyperbola, an ellipse and a parabola respectively. Which statement holds true?
- A $e < f < g$
- B $e < g < f$
- C $g < e < f$
- D $f < g < e$

26. Which one of the following functions is bounded in $\mathbb{R}$?
- A $\cosh x$
- B $\sinh x$
- C $\tanh x$
- D e^{-x}

27. The normal approximation to the Poisson distribution X with mean $\frac{1}{4}$ is
- A $X \sim N\left(\frac{1}{4}, \frac{3}{4}\right)$
- B $X \sim N\left(\frac{1}{4}, \frac{1}{4}\right)$
- C $X \sim N\left(\frac{3}{4}, \frac{3}{4}\right)$
- D $X \sim N\left(\frac{1}{2}, \frac{1}{2}\right)$

28. A compound pendulum oscillates through a small angle θ about its equilibrium position such that $10a\left(\dfrac{d\theta}{dt}\right)^2 = 4g\cos\theta,\quad a > 0$. Its period is
- A $2\pi\sqrt{\dfrac{5a}{4g}}$
- B $\dfrac{2\pi}{5}\sqrt{\dfrac{a}{g}}$
- C $2\pi\sqrt{\dfrac{2g}{5a}}$
- D $2\pi\sqrt{\dfrac{5a}{g}}$

29. The unit digit of the number $19^{1983} + 11^{1983} + 9^{1983}$ is
- A 1
- B 3
- C 7
- D 9

30. If $(a\mathbf{i} + 2\mathbf{j} - \mathbf{k}) \times (-\mathbf{j} + 3\mathbf{k}) = 5\mathbf{i} - 3\mathbf{j} - \mathbf{k}$. Then $a =$
- A 0
- B 1
- C 2
- D 3

31. Two particles A and B move on curves $\mathbf{r}_a = 2\mathbf{i} + 5t\mathbf{j}$ and $\mathbf{r}_b = 2t\mathbf{i} + 5\mathbf{j}$ respectively, for some parameter t. The shortest distance between the particles is
- A 0
- B 1
- C 2
- D 3

32. $\lim\limits_{x \to 1}\left(\dfrac{x^2 - 1}{2 - \sqrt{x^2 + 3}}\right) =$
- A 1
- B 0
- C -1
- D -4

33. The argument of the complex number $z = 1 + e^{2i\theta}$ is
- A $\frac{\theta}{4}$
- B $\frac{\theta}{2}$
- C θ
- D 2θ

34. The general solution of the differential equation $\frac{d^2x}{dt^2}+4x=0$, p and q being arbitrary constants is $x=$
   - A $p\cos(2t+q)$
   - B $pe^{2t}+qe^{-2t}$
   - C $(p+qt)e^{-2t}$
   - D $(p+qt)e^{2t}$

35. The root mean square value of $e^{\frac{x}{2}}$ on the interval $1\le x\le 2$ is
   - A $\frac{1}{2}e^2$
   - B $\frac{1}{2}(e^2-e)$
   - C e^2
   - D $(e^2-e)^{1/2}$

36. Using the approximation $h\left(\frac{dy}{dx}\right)_n \approx y_{n+1}-y_n$ and that $\frac{dy}{dx}=1$, $y=2$ when $x=0$. Then, $y_1=$
   - A $h-2$
   - B $h+2$
   - C $h-1$
   - D $h+1$

37. Which one of the following real functions is continuous on $\mathbb{R}$?
   - A $\ln x$
   - B $\frac{x}{x^2+1}$
   - C $\sqrt{x+1}$
   - D $\tan x$

38. The equation $3\cosh 2x=\frac{3}{2}$ has
   - A No solution
   - B One solution
   - C Two solutions
   - D Three solutions

39. $\frac{2x^2}{x^2-4}$ expressed in partial fractions where P, Q and R are real constants with $x\neq \pm 2$, is
   - A $\frac{P}{x+2}+\frac{Q}{x-2}$
   - B $P-\frac{Q}{x+2}-\frac{R}{x-2}$
   - C $\frac{P}{x-2}-\frac{Q}{(x-2)^2}$
   - D $P-\frac{Q}{x-2}-\frac{R}{(x-2)^2}$

40. A particle moving in a straight line OX has a displacement x from O at time t where x satisfies the equation $\frac{d^2x}{dt^2}+2\frac{dx}{dt}+3x=0$.
   The damping factor for the motion is
   - A e^{-t}
   - B e^{-2t}
   - C e^{-3t}
   - D e^{-5t}

41. The remainder when -84 is divided by 9 is
   - A -3
   - B -6
   - C 3
   - D 6

42. The work done when the point of application of the force $\mathbf{F}$ is given a displacement $\mathbf{d}$ is
   - A $\mathbf{d}\times\mathbf{F}$
   - B $\mathbf{F}\times\mathbf{d}$
   - C $|\mathbf{F}||\mathbf{d}|$
   - D $\mathbf{F}\cdot\mathbf{d}$

43. Given that $F(x)=\int_0^{x^2} f(t)dt$. $F'(x)=$
   - A $f(x)$
   - B $f(x^2)$
   - C $2f(x^2)$
   - D $2xf(x^2)$

44. A tangent at the pole to the polar curve $r = 2 - 4\sin\theta$ is

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

B $\theta = \frac{\pi}{4}$

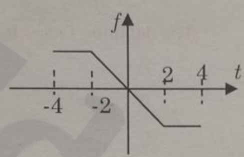
C $\theta = \frac{\pi}{3}$

D $\theta = \frac{\pi}{2}$

45. A particle P moves on the curve $\mathbf{r} = 3t\mathbf{i} + 4t^2\mathbf{j}$. The distance of P from the origin when $t = 1$ is

A 3
B 4
C 5
D 7

46. Given that $F(x) = \int_0^x f(t)dt,$ where f is defined on the interval $[-4,4]$ as shown on the graph. On what interval is F increasing?



A $[-4,0]$

B $[-2,2]$

C $[-2,0]$

D $[2,4]$

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

A $2(-4\mathbf{j} + 3\mathbf{k})$

B $-\frac{16}{5}(-4\mathbf{j} + 3\mathbf{k})$

C $-16(-4\mathbf{j} + 3\mathbf{k})$

D $10(-4\mathbf{j} + 3\mathbf{k})$

48. The physical quantity y is such that $y(t) = 2e^{-\frac{1}{20}t}$. This quantity can be modelled by the differential equation

A $\frac{dy}{dt} = 2y$

B $\frac{dy}{dt} = -\frac{1}{20}y$

C $\frac{dy}{dt} = -\frac{1}{10}y$

D $\frac{dy}{dt} = \frac{1}{10}y$

49. The moment of inertia of a uniform disc of mass m and radius a about an axis through its centre and perpendicular to the plane of the disc is $\frac{1}{2}ma^2$. The moment of inertia of the disc about a tangent in the plane of the disc is

A $\frac{1}{4}ma^2$

B $\frac{5}{4}ma^2$

C $\frac{3}{2}ma^2$

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

50. Given that $a * b = a + b - 1,$ where $*$ is a binary operation on $\mathbb{R}$. If the identity element is 1, then the inverse of x is

A $\frac{1}{x}$

B $2 - x$

C $x - 2$

D $x + 2$

STOP. GO BACK AND CHECK YOUR WORK