UNIVERSITY OF CALICUT
DEPARTMENT OF MATHEMATICS
M.Sc.(Mathematics) Entrance Examination, 2018 Admission onwards

SYLLABUS

The Syllabus and Question Paper of entrance examination is based on the core papers in Mathematics of BSc. Mathematics syllabus of Calicut University.

INSTRUCTIONS

- The examination is of **2 Hours duration** and the Question Paper will contain **50 Multiple Choice Questions** of **4 marks** each.
- Among the four options of each question given as (a), (b), (c) and (d), only one will be the most appropriate answer. The candidate should mark the bubble containing the letter corresponding to the most appropriate answer in the **OMR answer sheet** using ball point pen(blue or black).
- Total **four marks** will be given for each correct answer. **One** mark will be deducted for each wrong answer.

SAMPLE QUESTIONS

1. Which one the following can be the number of elements of the powerset of a set?

   (a) 125 (b) 126 (c) 127 (d) 128

2. Which one of the following is false?

   (a) The set of all sequences of positive integers is countable

   (b) The set of all finite subsets of the set of all positive integers is countable

   (c) The set of all functions from a finite set to the set of all positive integers is countable

   (d) None of the above

3. Let $f : A \to B$ and $g : B \to C$ be functions. If $g \circ f$ is an injection, then

   (a) g is an injection (b) f is an injection

   (c) f and g are injections (d) none of these is true

4. How many functions are there from the set of all real numbers to the empty set

   (a) 1 (b) 0 (c) Infinite (d) None of these

5. Which one of the following is true for a nonempty subset A of the set of all positive integers?

   (a) A contains a largest element (b) A contains a smallest element

   (c) A contains a maximal element (d) None of these

6. Which one of the following is true for any group of order 4 and any group of order 5?

   (a) abelian (b) cyclic (c) not abelian (d) not cyclic

7. Which one of the following is an integral domain?

   (a) $\mathbb{Z}_8$ (b) $\mathbb{Z}_9$ (c) $\mathbb{Z}_{10}$ (d) $\mathbb{Z}_{11}$

8. The slope of the line $\frac{1}{2}x - 3y = 1$ is

   (a) 6 (b) 1/6 (c) – 6 (d) –1/6

9. The area under the curve $y = e^x$, between $x = 1$ and $x = 4$ is

   (a) e^3 (b) e^5 (c) $e(e^3 - 1)$ (d) $e(e^5 - 1)$

10. The dimension of the vector space consisting of all $m \times n$ real matrices over the field of real numbers is same the dimension of the vector space

    (a) $\mathbb{R}^{m+n}$ (b) $\mathbb{R}^{mn}$ (c) $\mathbb{R}^{m^n}$ (d) none of these

11. Which one of the following functions defined on $\mathbb{R}$ is not continuous at 0, if $f(0) = 0$ and for $x \neq 0$, $f(x) =$

    (a) $x \mid x \mid$ (b) $Sin\ (\frac{1}{x})$ (c) $x\ Sin\ (\frac{1}{x})$ (d) $x^2\ Sin\ (\frac{1}{x})$

12. If $\phi(n)$, for $n \in \mathbb{N}$ denotes the number of positive integers not greater than n and relatively prime to n, then $\phi(pq)$ for distinct primes p and q is

    (a) pq (b) $pq - 1$ (c) $(p - 1)(q - 1)$ (d) $pq - 2$

13. Which one of the following complex numbers is a solution of $z^2 = i$?

(a) $(1+i)/\sqrt{2}$ (b) $(1+i)/2$ (c) $(-1+i)/\sqrt{2}$ (d) $(-1+i)/2$

14. $\lim_{x\to 0}\left(\frac{\tan x}{x}\right)^{1/x^2}$ is

(a) $e^{1/3}$ (b) e (c) e^2 (d)$e^{1/2}$

15. The radius of curvature of the curve $y = e^x$ at the point where it crosses the y - axis is

(a) 2 (b) $\sqrt{2}$ (c) $2\sqrt{2}$ (d) $\frac{1}{2}\sqrt{2}$

16. Consider the initial value problem (IVP) $y' = y^2, y(0) = 1, (x, y) \in \mathbb{R} \times \mathbb{R}$. Then there exists a unique solution on the IVP on

(a) $(-\infty, \infty)$ (b) $(-\infty, 1)$ (c) $(-3, 3)$ (d) $(-1, \infty)$

17. The Taylor's expansion of the series $\frac{1}{1+x^2}$ is

(a) $\sum_{n=0}^{\infty}(-1)^n x^{2n}$, for $-1 < x < 1$ (b) $\sum_{n=0}^{\infty} x^{2n}$, for $-1 < x < 1$
(c) $\sum_{n=0}^{\infty}(-1)^n x^{2n}$, for any real x (d) $\sum_{n=0}^{\infty}(-1)^n x^{2n}$, for $-1 \leq x < 1$

18. The Newton-Rapson formula algorithm for finding the cube root of N is

(a) $x_{n+1} = \frac{1}{3}\left[2x_n + \frac{N}{x_n^2}\right]$ (b) $x_{n+1} = \frac{1}{3}\left[2x_n - \frac{N}{x_n^2}\right]$
(c) $x_{n+1} = \frac{1}{3}\left[2x_n + \frac{N}{x_n}\right]$ (d)$x_{n+1} = \frac{1}{3}\left[2x_n - \frac{N}{x_n}\right]$