

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc DEGREE EXAMINATION MAY 2017
(Fifth Semester).**

Branch - MATHEMATICS

REAL ANALYSIS

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

• ALL questions carry EQUAL marks (10x2 = 20)

- 1 Prove that every infinite subset of a countable set A is countable.
- 2 Prove that every neighbourhood is an open set.
- 3 Define finite subcover.
- 4 Define separated set.
- 5 Define complete set.
- 6 Suppose the radius of convergence of $\sum C_n Z^n$ is 1, and suppose $C_0 > C_1 > C_2 > \dots$, $\lim_{n \rightarrow \infty} C_n = 0$. Then prove that $\sum C_n Z^n$ converges at every point on the circle $|z| = 1$, except possibly at $z = 1$.

- 7 Consider $f(x) = \begin{cases} x + 2 & (-3 < x < -2) \\ -x - 2 & (-2 < x < 0) \\ x + 2 & (0 < x < 1) \end{cases}$, Is it continuous at $x = 0$ or discontinuous at $x = 0$.
- 8 Define bounded set.
- 9 State mean value theorem

- 10 Let f be defined by $f(x) = \begin{cases} x^{s \times n} & (x \neq 0) \\ 0 & (x = 0) \end{cases}$, Is f is differentiable at x = 0.

SECTION - B (25 Marks)

Answer-ALL Questions

ALL Questions Carry EQUAL Marks (5x5 = 25)

- 11 a Let A be the set of all sequences whose elements are the digits 0 and 1. Then prove that this set A is uncountable.

OR

- b Let $\{E_a\}$ be a finite or infinite collection of sets E_a . Prove that $\bigcup_{a \in J} E_a = \bigcap_{\alpha} (E_{\alpha}^c)$

- 12 a Prove that compact subsets of metric spaces are closed.

OR

- b Let P be a non-empty perfect set in R^k . Prove that P is uncountable.

- 13 a Suppose $\{S_n\}$ is monotonic. Prove that $\{S_n\}$ converges if and only if it is bounded.

OR

- b $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges if $p > 1$ and diverges if $p < 1$. Prove.

Cont...

14 a Let f be a continuous mapping of a compact metric space X into a metric space Y . Prove that f is uniformly continuous on X .

OR •

b If f is a continuous mapping of a metric space X into a metric space Y , and if E is a connected subset of X , prove that $f(E)$ is connected.

15 a State and prove chain rule for differentiation.

OR

b Suppose f is a real differentiable function on $[a, b]$ and suppose $f'(a) < f'(b)$. Prove that there is a point $x \in (a, b)$ such that $f'(x) = X$.

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3x10 = 30)

16 Prove that

(a) For any collection $\{G_\alpha\}$ of open sets, $\bigcup_\alpha G_\alpha$ is open.

(b) For any collection $\{F_\alpha\}$ of closed sets, $\bigcap_\alpha F_\alpha$ is closed.

(c) For any finite collection G_1, G_2, \dots, G_n of open sets $\bigcap_{j=1}^n G_j$ is open.

(d) For any finite collection F_1, F_2, \dots, F_n of closed sets $\bigcup_{j=1}^n F_j$ is closed.

17 Prove that every K -cell is compact.

18 For any sequence $\{C_n\}$ of positive numbers, prove that

$$\liminf_{n \rightarrow \infty} C_n < \liminf_{n \rightarrow \infty} C_n \quad .$$

$$\limsup_{n \rightarrow \infty} C_n < \limsup_{n \rightarrow \infty} C_n$$

19 Prove that a mapping f of a metric space X into a metric space Y is continuous on X if and only if $f^{-1}(V)$ is open in X for every open set V in Y .

20 State and prove Taylor's theorem.

Z-Z-Z

END

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**BSc DEGREE EXAMINATION MAY 2017
(Fifth Semester)**

Branch - MATHEMATICS

PROGRAMMING IN C

Time : Three Hours ' , Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 State the rules for identifiers.
- 2 Define symbolic constants.
- 3 What is conditional operator?
- 4 What is the use of Pow () and Ceil () function?
- 5 Write the syntax of print f function.
- 6 What is the use of switch statement?
- 7 Write the general form of DO.. .While statement.
- 8 What is multi dimensional array?
- 9 Define function header.
- 10 How to use fscanf function?

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Write short notes on C tokens.
OR
b State the rules for defining symbolic constants. ' . .
- 12 a Explain about increment and decrement operators.
OR
b Write short notes on Mathematical functions.
- 13 a Discuss about reading a character in C programming with an example.
OR
b Write short notes on various if statements.
- 14 a Write a note on simple for loops with an examples.
OR
b Write a C program to create multiplication table 5X5 matrix.
- 15 a Give an account of function return values and their types.
• OR
b * Write short notes on pointers in C.

SECTION - C (30 Marks)

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 Describe various types of constants in C.
- 17 Write short notes on (i) Arithmetic operators ii) Relational operators. '
- 18 Write a C program to evaluate the power series e^x .
- 19 Explain about various looping structures in C language with an examples.
- 20 Describe input and output operations on files.