

(i) Printed Pages: 2

Roll No. ....

(ii) Questions : 8

Sub. Code : 

0	0	4	4
---	---	---	---

Exam. Code : 

0	0	0	1
---	---	---	---

B.A./B.Sc. (General) 1<sup>st</sup> Semester  
1128

MATHEMATICS

Paper : II Calculus-I

Time Allowed : Three Hours]

[Maximum Marks : 30

Note :— Attempt five questions, selecting at least two from each section.

SECTION—A

I. (a) Prove that between any two distinct real numbers, there exist infinitely many irrational numbers.

(b) Solve :

$$|x - 2| > -5. \quad 4,2$$

II. (a) Prove that the set :

$$S = \left\{ \frac{1-x}{1+x} : x \leq 0, x \neq -1 \right\}$$

is unbounded.

(b) If a set is bounded, then does its  $\ell$ .u.b. and g. $\ell$ .b. belong to set ? 4,2

III. (a) Does least upper bound property hold for rational numbers ? Justify.

(b) If  $f(x) = x \left[ \frac{1}{x} \right]$ , does

limit  $f(x)$  exist ? 4,2  
 $x \rightarrow \frac{1}{3}$

0044/EPY-7105

1

[Turn over

IV. (a) Evaluate :

$$\lim_{x \rightarrow \infty} \frac{\sin^{-1}\left(\frac{1}{x}\right)}{\tan\left(\frac{1}{x}\right)}$$

(b) Find a, b, c so that :

$$\lim_{x \rightarrow \infty} \frac{axe^x - b \sin x + cxe^{-x}}{x^3} = 2. \quad 2,4$$

### SECTION—B

V. (a) Expand  $\tan^{-1}x$  in powers of  $x$ .

(b) Prove that :

$$|\sin x - \sin y| \leq |x - y| \quad \forall x, y \in \mathbb{R}. \quad 3,3$$

VI. State and prove Rolle's theorem. Interpret geometrically. 6

VII. (a) If  $x = a(\cos t + t \sin t)$  and  $y = a(\sin t - t \cos t)$ . Find

$$\frac{d^2y}{dx^2} \text{ at } t = \frac{\pi}{4}.$$

(b) State and prove Leibnitz's theorem. 3,3

VIII. (a) If  $f(x) = e^{\tanh^{-1}\left(\frac{2x}{1+x^2}\right)} + (\cosh x)^x$

then find  $f'(x)$ . 3,3

(b) Prove that :

$$\frac{d}{dx} (\operatorname{sech}^{-1} x) = \frac{-1}{x\sqrt{1-x^2}}; 0 < x < 1. \quad 3,3$$

## Facing Problems in Graduation Math We are here to guide you.

We are here to help you. Mathematics as a subject in graduation is a challenging task for many students. We focus on basics and art of problem solving rather than just learning the solution part.

### Doubt Solving:

Our Doubt Clearance Sessions, emphasizing Misconceptions and repeated errors. Along with that, we help you create study plan that will ensure your success in exam.

### Foundation for IIT JAM & CSIR NET and Competitive Maths

Mathematics in Graduation is first step towards the higher and competitive Maths. We focus on conceptual understanding which work as a base for the competitive maths.

### Clear B.Sc., B.Com, BCA, B.Tech College Maths with good grades

Getting good marks along with conceptual understanding will boost your confidence. Feel free to ask for Demo sessions. You have liberty to join the classes for specific topic rather than whole book.

### Dr. Himanshu Singla (Ph.D Maths)

7 Years Teaching Experience at prestigious institutes like NMIMS (Chd), DAVC Sector 10, PGGC 11 Chd., UIET Sector 25



## We make Maths easy for you at Abhyaskul. We are here to guide you.

We are here to help you. Mathematics as a subject in graduation is a challenging task for many students. We focus on basics and art of problem solving rather than just learning the solution part.

### Follow our You Tube Channel. (Search Abhyaskul at You Tube)

Learn the basics of math at our YouTube channel!

Our channel covers a wide range of math topics, from basic arithmetic to algebra and geometry. You can always ask to make a video on any topic. We wil try to provide it as soon as possible.

Whether you're struggling with a particular concept or just want to brush up on your math skills, our YouTube channel is a great resource. Visit our channel today and start learning!

### Career Opportunities in Maths

After graduating in maths, a world of opportunities opens up. You can pursue careers in finance, data science, engineering, research, or academia. Maths graduates are in demand for their analytical and problem-solving skills, and they can play a key role in driving innovation and solving complex challenges in a variety of industries. For any query regarding career opportunity in Math, feel free to meet.

### Dr. Himanshu Singla (Ph.D Maths)

7 Years Teaching Experience at prestigious institutes like NMIMS (Chd), DAVC Sector 10, PGGC 11 Chd., UIET Sector 25

