ADITYA DEGREE COLLEGES

ANDHRA PRADESH

IV SEMESTER - PREFINAL EXAMINATIONS

II B.Sc - MATHEMATICS

Date: **Max. Marks : 75**
Time : 3 Hours

SECTION - A

I. Answer any FIVE questions from the following **5X5= 25M**

1. State and prove Sandwich theorem

2. Test for convergence $\sum_{n=1}^{\infty}\left(\sqrt[3]{n^3+1}-n\right)$

3. Test for convergent $\sum \frac{x^n}{x^n+a^n}$ $(x>0, a>0)$

4. Examine the continuity of f(x) = $|x|+|x-1|$ at x=0,1

5. Prove that $Tan\,x > x > \sin x \forall x \in \left(0, \frac{\pi}{2}\right)$

6. Verify Cauchy's mean value theorem for f(x)= $\sqrt{x}$ *and* $g(x)=1/\sqrt{x}$ in [a,b] where 0<a<b

7. If $f(x)=x^2$ on $[0,1]$ & $P=\left\{0,\frac{1}{3},\frac{2}{3},1\right\}$ find $U(P,f)$ & $L(P,f)$.

8. Show that every monotonic on [a,b] then f is integrable on [a,b]

SECTION - B

II. Answer ALL Questions **5X10=50M**

9. a) State and prove Cauchy's general principle for convergence.

(OR)

b) State and prove monotone converge theorem

10. a) State and prove Ratio test.

(OR)

b) State and prove leibnitz's Test and prove that $1-\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{4}}........+\frac{(-1)^{n-1}}{\sqrt{n}}......$ converges

11. a) State and prove absolute maximum minimum theorem.

(OR)

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(i) Every continuous function on [a,b] is uniformly continuous on [a,b]

(ii) Discuss the types of discontinuties

12. a) State and prove Rolle's theorem.

(OR)

b) (i)Show that $f(x)=x^2 \cos(1/x)$, $x \neq 0$; $f(x)=0, x=0$ is derivable everywhere but the derivative is not continuous at 0

(ii) Show that for 0<u<v.

13. a) (i) If $f \in R[a,b]$ and is a primitive of , then $\int_a^b f(x)dx = \phi(b) - \phi(a)$

(ii) Prove that $\frac{1}{\pi} \leq \int_0^1 \frac{\sin \pi x}{1 + x^2} dx \leq \frac{2}{\pi}$.

(OR)

b) State and prove a necessary and sufficient condition for R-integrable on $[a,b]$.

$$\frac{v-u}{1+v^2} < Tan^{-1}v - Tan^{-1}u < \frac{v-u}{1+u^2}$$

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