Paper Code: 4101 Regd. No

SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc., Degree Examinations, Mar/Apr 2017

(At the end of 4th Semester)

(For 2015-18 batch)

Part – II **MATHEMATICS** Paper – II B

(Real Analysis)

Date: 06.04.2017 FN Max Marks: 75

Duration:3hrs

PART-I

Answer any **FIVE** questions, each questions carries **FIVE** marks. 5 X 5 = 25M

1. If $S_n = \frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + ... + \frac{1}{n(n+1)}$ then Show that $\{S_n\}$ is increasing and bounded.

2. Prove that every convergent sequence is bounded.

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

4. Test for convergence of $\sum \frac{1\cdot3\cdot5\cdots\cdots(2n-1)}{2\cdot4\cdot6\cdots\cdots2n} x^{n-1}$

5. Examine whether the function f defined by $f(x) = x\text{Sin}\left(\frac{1}{x}\right)$ when $x \neq 0$ and $f(0) = 0$ is continuous at the origin.

6. Show that $f(x) = |x| + |x-1|$ is not derivable at $x = 0$ and $x = 1$.

7. Verify Cauchy's mean value theorem for $f(x) = x^2$ and $g(x) = x^3$ in $[1,2]$.

8. If the function f is defined by $f(x) = \begin{cases} 1 \text{ if } x \in Q \\ 0 \text{ if } x \in R - Q \end{cases}$ then show that f is not Riemann Integrable over any interval of R.

PART-II

Answer any **FIVE** questions from the following, choosing atleast **TWO** questions from each section. Each question carries **TEN** marks. $5X10 = 50M$

SECTION-A

9. If $S_n = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\cdots+\frac{1}{n}$ then show that $\{s_n\}$ is not convergent by using Cauchy's general principle of convergence theorem.

10. Prove that a sequence is convergent iff it is a Cauchy sequence.

11. State and prove Cauchy's n^{th} root test.

12. Define Alternating series. State and Prove Leibnitz's test.

13. Prove that the function f defined on R^+ as $f(x)=\text{Sin}\left(\frac{1}{x}\right)$ for every $x>0$ is continuous but not uniformly continuous on R^+.

SECTION-B

14. State and prove Rolle 's Theorem.

15. Find c of Lagrange's mean value theorem for f(x) =(x-1)(x-2)(x-3) on $[0,4]$.

16. If f is continuous on [a, b] then prove that f is R-Integrable on [a, b].

17. Show that $\frac{1}{\pi}\leq\int_0^1\frac{\sin\pi x}{1+x^2}dx\leq\frac{2}{\pi}$.

18. State and prove fundamental theorem of integral calculus.

Paper Code: 4101 Regd. No. [| | | | | | | |]

SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc.,Degree Examinations, Mar/Apr 2018

(At the end of 4th Semester)

Regular (2016-19 batch),Supplementary (2015-18 batch)

MATHEMATICS Paper – IV

(Real Analysis)

Date: 31.03.2018 FN

Duration:3hrs

Max Marks: 75

PART - I

Answer any FIVE questions : **5x5=25**

1. If $\{S_n\}$ is a sequence such that $S_n > 0 \forall n \in Z^+$ and $\lim \frac{S_{n+1}}{S_n} = l$ then $\lim \sqrt[n]{S_n} = l$

2. Prove that $\lim_{n\to\infty}\left\{\frac{1}{\sqrt{n^2+1}}+\frac{1}{\sqrt{n^2+2}}+.....+\frac{1}{\sqrt{n^2+n}}\right\}=1$

3. Examine the convergence of $\sum_{n=1}^{\infty}(-1)^n\frac{1}{n}\left(1+\frac{1}{2}+\frac{1}{3}+....+\frac{1}{n}\right)$

4. Test for convergence $\sum_{n=1}^{\infty}3^{-n-(-1)^n}$

5. Show that $f: R \to R$ defined by $f(x)=1$ if $x \in Q$ and $f(x)=-1$ if $x \in R-Q$ is discontinuous for all $x \in R$

6. If $f:[a,b] \to R$ is derivable at $c \in [a,b]$ then prove that f is continuous at C

7. Prove that $\frac{\Pi}{6}+\frac{\sqrt{3}}{15}<\sin^{-1}0.6<\frac{\Pi}{6}+\frac{1}{8}$

8. Prove that $f(x)=\sin x$ is integrable on $\left[0,\frac{\Pi}{2}\right]$ and $\int_0^{\Pi/2}\sin x dx = 1$

PART - II

Answer any FIVE questions choosing atleast TWO questions from each section : 5x10=50

SECTION - A

9. If $S_n = \left(1+\frac{1}{n}\right)^n$ then show that $\{S_n\}$ is convergent

10. Discuss the nature of the sequence $\{r^n\}$ for all $r \in R$

11. Test for convergence of $\sum\left(\sqrt[3]{n^3+1}-n\right)$

12. Define alternating series. State and prove Leibnitz's test

13. State and prove Bolzano's intermediate value theorem

SECTION - B

14. State and prove Rolle's theorem

15. Show that $\frac{v-u}{1+v^2} < Tan^{-1}V - Tan^{-1}u < \frac{v-u}{1+u^2}, 0 < u < v$ and deduce that $2 < \Pi < 4$

16. A bounded function $f:[a,b] \to R$ is Riemann integrable on $[a,b]$ iff for each $\in > 0$ there exists a partition P of $[a,b]$ such that $0 \le U(P,f) - L(P,f) < \in$

17. State and prove first mean value theorem

18. Show that $\frac{1}{\Pi} \le \int_0^1 \frac{\sin \Pi x}{1+x^2} dx \le \frac{2}{\Pi}$

Paper Code: 4101 Regd. No

SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc., Degree Examinations, Mar/Apr 2019

(At the end of 4^{th} Semester)

Regular (2017 batch), Supplementary (2016,2015 batches)

MATHEMATICS Paper – IV

(Real Analysis)

Date: 15.04.2019 FN Max Marks:75

Duration:3hr

PART – I

Answer any FIVE questions, each question carries Five marks **5×5=25M**

1. Prove that every convergent sequence is bounded
2. Prove that the sequence {Sn} defined by Sn = $1+\frac{1}{1!}+\frac{1}{2!}+\text{-----}+\frac{1}{n!}$ is convergent.
3. Test for convergence of $\sum_{n=1}^{\infty}(\sqrt{n^4+1} - \sqrt{n^4-1})$.
4. Test for convergence of $\sum_{n=1}^{\infty}\frac{(n!)^2}{(2n)!}$
5. Show that the function f defined by f(x) = x^3 is uniformly continuous in [-2,2].
6. If f:[a,b] →R is derivable at c∈[a,b] then prove that f is continuous at C.
7. Prove that $\frac{x}{1+x^2}$ < $\tan^{-1}x < x$, when x>0
8. If f(x)=x^2 on [0,1] and p=$\{0,\frac{1}{4},\frac{2}{4},\frac{3}{4},1\}$ find L (p,f) and U (p,f).

PART – II

Answer any FIVE questions. Choosing at least TWO questions from each section. Each question carries 10 Marks **5×10=50M**

SECTION – A

9. State and prove Cauchy's first theorem on limits.
10. Prove that a monotone sequence is convergent iff it is bounded.
11. State and prove D-Alembert's test.
12. State and prove liebnitz test.
13. Find the constants a,b so that the function f defined by f(x)=2x+1 if x≤ 1, f(x) = ax^2+b if 1<x<3 , f(x)=5x+2a if x≥3 is continuous at x=1,x=3.

SECTION – B

14. State and prove Rolle's theorem.
15. Prove that $\frac{\pi}{6}+\frac{\sqrt{3}}{15}$ <$\sin^{-1}0.6$ < $\frac{\pi}{6}+\frac{1}{8}$ by using lagranges mean value theorem.
16. A bounded function f:[a,b] →R is Riemann integrable on [a,b] iff for each ∈>0 there exists a partition P of [a,b] such that 0≤U(p,f)-L(p,f)< ∈.
17. If f:[a,b] →R is monotonic on [a,b] then prove that f is integrable on [a,b]
18. Prove that $\frac{\pi^3}{24} \le \int_0^{\pi}\frac{x^2}{5+3\cos x}dx \le \frac{\pi^3}{6}$.

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Paper Code: 4101 Regd. No

SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc., Degree Examinations, October 2020

(At the end of 4^{th} Semester)

Regular (2018-21 batch)

MATHEMATICS Paper – IV

(Real Analysis)

Date: 03.11.2020 FN

Duration:3hrs

Max Marks:75

PART - I

Answer any **FIVE** questions, Each question carries **FIVE** marks. 5 x 5 = 25 M

1. State and prove sandwich theorem.
2. If $S_n = 1 + \frac{1}{1!} + \frac{1}{2!} + - - - + \frac{1}{n!}$ then show that $\{S_n\}$ converges.
3. Test for convergence of $\sum (\sqrt{n^4+1} - \sqrt{n^4-1})$
4. State and prove Leibnitz's Test.
5. If f is continuous on [a, b] then Prove that f is bounded on [a, b].
6. Find 'C' of Lagrange's theorem for $f(x) = x(x-1)(x-2)$ on $[0, {}^1/_2]$.
7. The Maclaurin's Expansion of Sin x.
8. If f: [a, b] --> R is continuous on [a, b] then Prove that f is R - Integrable on [a, b]

PART - II

Answer any **FIVE** questions. Choosing atleast TWO questions from Each section.

Each Question carries **TEN** marks. 5 x 10 = 50 M

SECTION - A

9. State and prove cauchy's First theorem on Limits.
10. Prove that A monotonic sequence is convergent iff it is bounded.
11. State and prove P-Test.
12. State and prove limit comparison test.
13. Let f : R --> R be such that $f(x) = \begin{cases} \frac{\sin(a+1)x + \sin x}{x} & \text{for } x < 0 \\ C & \text{for } x = 0 \\ \frac{(x+bx^2)^{1/2} - x^{1/2}}{bx^{3/2}} & \text{for } x > 0 \end{cases}$

    Determine the values of a, b, c for which the function is continous at x = 0.

SECTION - B

14. State and prove Rolle's theorem.

15. State and prove cauchy's mean value theorem.

16. Prove that A bounded function $f : [a, b] \to R$ is Riemann integrable on $[a, b]$ iff for each $\varepsilon > 0$ there exists a partition p of $[a, b]$ such that $0 \leq U(p, f) - L(p, f) < \varepsilon$.

17. State and prove Fundamental theorem of integral calculus.

18. Prove that $\frac{\pi^3}{24} \leq \int_0^{\pi} \frac{x^2}{5+3\cos x}\,dx \leq \frac{\pi^3}{6}$

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Paper Code: 4101 Regd. No

SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc/B.Com/B.B.A/B.A., Degree Examinations, June 2022

(At the end of 4^{th} Semester)

Supplementary (2019,2018,2017,2016 batches)

MATHEMATICS

Paper – IV

(Real Analysis)

Date: 29.06.2022 FN
Duration:3hrs

Max Marks:75

SECTION-A

Answer any FIVE Questions, each question carries FIVE marks 5 x 5 = 25M

1. Prove that every convergent sequence is bounded.
2. Prove that $lim\left[\frac{1}{(n+1)^2}+\frac{1}{(n+2)^2}+---+\frac{1}{(n+n)^2}\right]=0$.
3. Test the convergence of $\sum_{n=1}^{\infty}\frac{2^n-2}{2^n+1}x^n, (x>0)$.
4. Test the convergence of $\frac{1}{1.2}-\frac{1}{3.4}+\frac{1}{5.6}-\frac{1}{7.8}+------$
5. Examine the continuity of the function $f(x)=\frac{1-cosx}{x^2}, x\neq 0, f(0)=1$ at x = 0.
6. If $f:[a,b]\rightarrow R$ is derivable at c ∈[a,b], then prove that f is continuous at c.
7. Verify Cauchy's mean value theorem for $f(x) = x^2$, $g(x) = x^3$ in [1,2].
8. Prove that f(x) = sinx is integrable on $[0,\frac{\pi}{2}]$ and $\int_0^{\frac{\pi}{2}} sinx\, dx = 1$.

Answer any FIVE Questions from sections B and C choosing at least Two questions from each section. Each question carries 10 marks. 5 x 10 = 50M

SECTION-B

9. Prove that a sequence is convergent if and only if it is a Cauchy sequence.
10. If $s_n=\frac{1}{n+1}+\frac{1}{n+2}+------+\frac{1}{n+n}$ then Show that $\{s_n\}$ is convergent.
11. State and prove p-test.
12. State and prove Cauchy's n^{th} root test.
13. Prove that if f is continuous on [a,b] then prove that f is bounded on [a,b].

SECTION-C

14. State and prove Rolle's theorem.
15. using Lagrange's theorem, show that $x > \log(1+x) > \frac{x}{1+x}\ \forall x > 0$.
16. If $f:[a,b]\rightarrow R$ is continuous on [a,b], then prove that f is R- integrable on [a,b].
17. State and prove fundamental theorem of integral calculus.
18. Prove that $\frac{\pi^3}{24}\leq\int_0^{\pi}\frac{x^2}{5+3cosx}dx\leq\frac{\pi^3}{6}$.

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SRI Y.N.COLLEGE (AUTONOMOUS)–NARSAPUR, W.G.Dt.

(Affiliated to Adikavi Nannaya University)

II B.Sc/B.Com/B.B.A/B.A., Degree Examinations, June 2022

(At the end of 4th Semester)

Supplementary (2019,2018,2017,2016 batches)

MATHEMATICS Paper – IV

(Real Analysis)

Date: 29.06.2022 FN Max Marks:75

Duration:3hrs

SECTION-A

Answer any FIVE Questions, each question carries FIVE marks **5 x 5 = 25M**

1. Prove that every convergent sequence is bounded.
2. Prove that $lim\left[\frac{1}{(n+1)^2}+\frac{1}{(n+2)^2}+---+\frac{1}{(n+n)^2}\right]=0$.
3. Test the convergence of $\sum_{n=1}^{\infty}\frac{2^n-2}{2^n+1}x^n, (x>0)$.
4. Test the convergence of $\frac{1}{1.2}-\frac{1}{3.4}+\frac{1}{5.6}-\frac{1}{7.8}+------$
5. Examine the continuity of the function $f(x)=\frac{1-cosx}{x^2}, x\neq 0, f(0)=1$ at x = 0.
6. If $f:[a,b]\to R$ is derivable at c ∈[a,b], then prove that f is continuous at c.
7. Verify Cauchy's mean value theorem for f(x) = x^2, g(x) = x^3 in [1,2].
8. Prove that f(x) = sinx is integrable on $[0,\frac{\pi}{2}]$ and $\int_0^{\frac{\pi}{2}} sinx\,dx = 1$.

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10. If $s_n=\frac{1}{n+1}+\frac{1}{n+2}+------+\frac{1}{n+n}$ then Show that $\{s_n\}$ is convergent.
11. State and prove p-test.
12. State and prove Cauchy's n^{th} root test.
13. Prove that if f is continuous on [a,b] then prove that f is bounded on [a,b].

SECTION-C

14. State and prove Rolle's theorem.
15. using Lagrange's theorem, show that x > log(1+x) $>\frac{x}{1+x}\ \forall x>0$.
16. If $f:[a,b]\to R$ is continuous on [a,b], then prove that f is R- integrable on [a,b].
17. State and prove fundamental theorem of integral calculus.
18. Prove that $\frac{\pi^3}{24}\leq\int_0^{\pi}\frac{x^2}{5+3cosx}dx\leq\frac{\pi^3}{6}$.