ADIKAVI NANNAYA UNIVERSITY
END SEMESTER EXAMINATIONS
M.Sc. Applied Mathematics
I-SEMESTER
AM 101: REAL ANALYSIS
[W.E.F.2016 A.B]

(Model Question Paper)

Time: 3 hrs. **Max. Marks:75**

Answer **ALL** Questions: Marks:5x15=75

1. (a) prove that $f \in R(\alpha)$ on $[a,b]$ if and only if for every $\varepsilon > 0$, there exists a partition P on $[a,b]$ such that $0 \le U(P,f,\alpha) - L(P,f,\alpha) < \varepsilon$

   (b) if f is monotonic on $[a,b]$ and if α is continuous on $[a,b]$, then show that $f \in R(\alpha)$

(OR)

2.(a)state and prove fundamental theorem of integral calculus

   (b) If **f** maps $[a,b]$ into R^k and if $\mathbf{f} \in R(\alpha)$ for some monotonically increasing function α on $[a,b]$, then prove that $|\mathbf{f}| \in R(\alpha)$ and $\left|\int_a^b \mathbf{f} d\alpha\right| \le \int_a^b |\mathbf{f}| d\alpha$

3.state and prove Stone – Weierstrass theorem

(OR)

4.(a) prove that there exist a real continuous function on the real line which is no where differentiable.

   (b) Suppose $\{f_n\}$ converges to f uniformly on the set E in a metric space X. let x be a limit point of E such that $\lim_{t \to x} f_n(t) = A_n$, $n = 1,2,3,....$, then prove that $\{A_n\}$ converges and so, $\lim_{t \to x}\lim_{n \to \infty} f_n(t) = \lim_{n \to \infty}\lim_{t \to x} f_n(t)$

5)(a)Define absolute convergence. Show that every absolutely convergent integral is convergent.

   (b)Test the convergence of the integral $\int_0^1 x^p (\log \frac{1}{x})^q dx$.

(OR)

6(a)State and prove Abel's Test.

   (b)Show that the integral $\int_1^\infty \frac{\sin x}{x^p} dx$ is convergent for p>0.

7)(a) State and prove Schwarz's theorem

   (b)Show that $z = f(x^2 y)$, where f is differentiable, satisfies $x(\frac{\partial z}{\partial x}) = 2y(\frac{\partial z}{\partial y})$

(OR)

8(a) State and prove Taylor's theorem.

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(b)Find the maxima and minima of the function $f(x,y)=x^3+y^3-3x-12y+20$

9. Answer any **Three** of the following:

(a) if $f_1, f_2 \in R(\alpha)$ on $[a,b]$, then show that $f_1+f_2 \in R(\alpha)$ and $cf \in R(\alpha)$ for every constant c and $f \in R(\alpha)$

(b) give an example of a sequence of functions that disproves $\lim_{t\to x}\lim_{n\to\infty} f_n(t)=\lim_{n\to\infty}\lim_{t\to x} f_n(t)$

(c)Examine the convergence of $\int_0^1 \frac{dx}{\sqrt{1-x}}$

(d)Show the function f(x,y)= $\begin{cases} \frac{xy}{\sqrt{x^2+y^2}}, (x,y)\neq(0,0) \\ 0, (x,y)=(0,0) \end{cases}$ is continuous at the origin.

(e)Show that the function $f(x,y)=\begin{cases} xy\frac{x^2-y^2}{x^2+y^2} \quad , if x^2+y^2\neq 0 \\ 0, if x=y=0 \end{cases}$ is differentiable at the origin.

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ADIKAVI NANNAYA UNIVERSITY
END SEMESTER EXAMINATIONS
M.Sc. Applied Mathematics
I-SEMESTER
AM 102: ORDINARY DIFFERENTIAL EQUATIONS
[W.E.F.2016 A.B]
(Model Question Paper)

Time: 3 hrs. **Max. Marks:75**

Answer **ALL** Questions: Marks:5x15=75

1. Let the functions $b_1, \ldots, b_n$ in $L(x)(t)=x^{(n)}(t)+b_1(t)x^{(n-1)}(t)+\ldots+b_n(t)x(t)$ be defined and continuous on an interval I. Let $\phi_1,\ldots,\phi_n$ be n linearly independent solutions existing on I containing a point t_0. Prove that $w(t)=\exp\left[-\int_{t_0}^{t} b_1(s)ds\right]w(t_0); t_0, t \in I$

(OR)

2. Solve $x^{(4)}+4x=0$

3. If $P_n(t)$ and $P_m(t)$ are Legendre polynomials, prove that $\int_{-1}^{1} P_n(t)P_m(t)dt = \;$ if $m \neq n$ and $\int_{-1}^{1} P_n^2(t)dt = \frac{2}{2n+1}$

(OR)

4. Prove that $\frac{d}{dt}[t^p J_p(t)] = t^p J_{p-1}(t)$ and $\frac{d}{dt}[t^{-p} J_p(t)] = -t^{-p} J_{p+1}(t)$

5. Let A(t) be an $n \times n$ matrix that is continuous int on a closed and bounded interval I. Prove that there exists a solution to the IVP $x' = A(t)x \quad x(t_0)=x_0; \quad (t, t_0 \in I)$ on I Also prove that this solution is unique.

(OR)

6. Find a fundamental matrix for the system $x' = Ax$ where A= $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 6 & -11 & 6 \end{bmatrix}$

7. State and prove Picard's theorem.

(OR)

8. State and prove Contraction Principle.

9. Answer any **three** of the following:

a) Prove that x^4, $x^3|x|$ are linearly independent function on [-1,1] but they are linearly dependent on [-1,0] and [0,1]

b) Solve $6t^2x'' + tx' + x = 0$

c) Show that $J_{r-1}(t) - J_{r+1}(t) = 2J_r'(t)$

d) Find a fundamental matrix for the system x'=Ax where

$$A = \begin{bmatrix} \alpha_1 & 0 & 0 \\ 0 & \alpha_2 & 0 \\ 0 & 0 & \alpha_3 \end{bmatrix}; \; \alpha_1, \alpha_2 \text{ and } \alpha_3 \text{ are scalars.}$$

e) Solve the IVP x'=x, x(0)=1 by the method of successive approximations.

ADIKAVI NANNAYA UNIVERSITY
END SEMESTER EXAMINATIONS
M.Sc. Applied Mathematics
I-SEMESTER
AM 103: PROBABILITY & STATISTICS
[W.E.F.2016 A.B]
(Model Question Paper)

Time: 3 hrs. **Max. Marks:75**

Answer **ALL** Questions: Marks:5x15=75

1) From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn at random. Let the random variable X denote the number of defective items in the sample. Find the probability distribution of X when the sample is drawn without replacement and also find Expectation and Variance.

(OR)

2) If 't' is any positive real number, show that the function defined by $P(x) = e^{-t}(1 - e^{-t})^{x-1}$ can represent a probability function of a random variable X assuming the values 1, 2, 3... Find E(X) and Var (X) of the distribution.

3) Fit a Poisson distribution to the following data:

Number of mistakes per page	:	0	1	2	3	4	Total
Number of pages	:	109	65	22	3	1	200

(OR)

4) In a distribution exactly normal, 10.03% of the items are under 25 kilogram weight and 89.97% of the items are under 70 kilogram weight. What are the mean and standard deviation of the distribution?

5) Calculate the correlation coefficient for the following heights (in inches) of fathers (X) and their sons (Y):

X	:	65	66	67	67	68	69	70	72
Y	:	67	68	65	68	72	72	69	71

(OR)

6) Ten competitors in a musical test were ranked by the three judges A, B and C in the following order:

Ranks by A:	1	6	5	10	3	2	4	9	7	8
Ranks by B:	3	5	8	4	7	10	2	1	6	9
Ranks by C:	6	4	9	8	1	2	3	10	5	7

Using rank correlation method discuss which pair of judges has the nearest approach to common likings in music.

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7) A survey of 800 families with four children each revealed the following distribution:

No. of boys	:	0	1	2	3	4
No. of girls	:	4	3	2	1	0
No. of families	:	32	178	290	236	64

Is this result consistent with the hypothesis that male and female births are equally probable?

(OR)

8) A random sample of 10 boys has the following I.Q.'s: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100? Find a reasonable range in which most of the mean I.Q. values of samples of 10 boys lie.

9) Answer any three of the following:

a) If a random variable has the probability density $f(x)$ as

$$f(x)=\begin{cases}2e^{-2x}, & for\ x>0\\ 0\ , & for\ x\le 0\end{cases}$$, find the probabilities that it will take on a value

i) Between 1 and 3 ii) greater than 0.5

b) A die is thrown 6 times, if getting an even number is a success, find the probabilities of

(i) At least one success

(ii) ≤ 3 success

(iii) 4 success.

c) Write chief characteristics of the normal distribution

d) If θ is the angle between two regression lines and S.D. of Y is twice the S.D. of X and r = 0.25, find $\tan\theta$.

e) A random sample of 500 apples was taken from a largeconsignment and 60 were found to be bad. Obtain the 98% confidence limits for the percentage of bad apples in the consignment.

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END SEMESTER EXAMINATIONS
M.Sc. Applied Mathematics
I-SEMESTER
AM 104: ALGEBRA
[W.E.F.2016 A.B]
(Model Question Paper)

Time: 3 hrs. Max. Marks:75

Answer ALL Questions: Marks:5x15=75

1. (i) The set Aut(G) of all automorphisms of a group G is a group under composition of mappings and $G/Z(G) \cong In(G)$

   (ii) State and prove Cayley's theorem.

(OR)

2. (i) State and prove Jordan-Holder theorem.

   (ii) Define Nilpotent group. Prove that a group of order p^n (p prime) is nilpotent.

3. (i) State and prove Cauchy's theorem for abelian groups

   (ii) State and prove First Sylow theorem

(OR)

4. State and prove Second &Third Sylow theorems

5. (i) State and prove Fundamental theorem of homomorphism

   (ii) If K is an ideal in a ring R then show that each ideal in R/K is of the form A/K where A is an ideal in R containing K.

(OR)

6. i) In a non-zero commutative ring with unity, prove that an ideal M is maximal if and only if R/M is a field.

   ii) If R is a commutative ring then prove that an ideal P in R is prime if and only if $ab \in P, a \in R, b \in R \Rightarrow a \in P or b \in P.$

7. (i) Prove that an irreducible element in a commutative principal ideal domain (PID) is always prime

   (ii)Show that Every Euclidian domain is a PID

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(OR)

8. (i)State and prove Gauss lemma

(ii)Let R be a commutatuive ring and P a prime ideal . Then S=R-P is a multiplicative set and R_s is a local ring with unique maximal ideal $P_s=\{a/s \mid a \in p, s \notin P\}$.

9. Answer any **Three** of the following:

a) Define Automormorphism of a group. Prove that every group of order p^2 (p prime) is abelian

b) Find the non isomorphic abelian groups of order 360

c) Define Ideal and Maximal ideal. Give two examples each.

d) Define nilpotent ideal and give an example.

e) Define Euclidean domain and give an example. Define Local ring.

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END SEMESTER EXAMINATIONS

M.Sc. Applied Mathematics

I-SEMESTER

AM 105: C PROGRAMMING

[W.E.F.2016 A.B]

(Model Question Paper)

Time: 3 hrs. **Max. Marks:75**

Answer **ALL** Questions:

Marks:5x15=75

1) Explain Data types in C with examples.

(OR)

2) Describe different categories of operators in C with examples.

3) Explain conditional control structures in C.

(OR)

4) i) Write a program to generate Prime numbers up to N.
   ii) Explain GO TO statement with suitable example.

5) i) What is recursion in functions? Write a program to find the factorial of given number using recursion.
   ii) Write a C program to multiply two given matrices

(OR)

6) Discuss in detail about storage classes in C.

7) What is pointer? Explain the advantages of Pointer with suitable examples

(OR)

8) Write a C program to process student data in generating results using array of structures.

9) Answer any **three** of the following:
   a) Discuss in brief about structure of a C program.
   b) What are the input output statements in C? Explain?
   c) Write a program to print the following output

```
1   2   3   4   5
1   2   3   4
1   2   3
1   2
1
```

   d) Explain String handling functions.
   e) Explain given below
      i) Call by value ii) Call by reference

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