

Rayat Shikshan Sanstha's
Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani
Commerce College, Kopargaon 423601,
Dist. Ahmednagar, (MS)-India

**Internal Quality Assurance Cell
(IQAC)**

Syllabus Approval Letter

Date: 18/12/2018

The IQAC committee has approved to submitted syllabus of short term/COC
courses planted to be conducted by Department Mathematics.

Sr. No.	Name of the Courses	Type of Course
1	Mathematics for Competitive Examinations	Short Term Course

HOD of Mathematics may proceed accordingly.


Date :-18/12/2018

Place: Kopargaon


IQAC- Coordinator

S.S.G.M. College, Kopargaon




Department of Mathematics,
S. S. G. M. College, Kopargaon.

Rayat Shikshan Sanstha's,
S.S.G.M. College, Kopargaon
Department of Mathematics
SHORT-TERM COURSE (2018-2019)
“Mathematics for Competitive Examinations”
SYLLABUS

Introduction:

Mathematics department has decided to start a short-term course “Mathematics for Competitive Exam”. Taking into consideration a new approaches in different areas of Mathematics. Mathematics department has prepared the syllabus for stated course.

The committee was constituted as follows

1. Ms. D. R. Chouhan (Head and member)
2. Mr.R. J. Ukirde (Member)
3. Dr. P. G. Andhare (Ex-Member of BOS, SPPU, Pune)

Aims:

1. Develop mathematical curiosity and inductive and deductive reasoning when solving problems.
2. Develop the knowledge, skills, and attitudes necessary to pursue further study in mathematics.
3. Develop abstract, logical and critical thinking.

Objectives:

1. Use appropriate mathematical concepts and skills to solve problems.
2. Know and demonstrate understanding of the mathematical concepts.
3. Select and apply general rules correctly to solve problems.

Details of Syllabus:

Real Analysis –

(08 Lect.)

Sequence and series of real numbers, Limit, Continuity, Differentiation, Mean Value Theorems, Partial Derivatives and Euler's theorem, Convergence and divergence, Cauchy sequences, Tests of convergence, Alternate series and their convergence

Linear Algebra –

(08 Lect.)

Matrix Algebra and System of Linear equations, Vector spaces, Linear Dependence, Basis, Dimension, Linear Transforms, Rank-Nullity theorem, Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of matrices, Hermitian and skew hermitian matrices.

Abstract Algebra –

(06 Lect.)

Group, Subgroup, Cyclic group, Normal subgroup, Lagrange's theorem, Permutation group, Quotient group, Homomorphism's and Isomorphism

Metric Spaces –

(06 Lect.)

Metric spaces, Open and Closed sets, Interior points, Closure of a set, Convergent sequence, Cauchy sequences, Complete spaces, Dense set, compactness, Connectedness

Basics of Set Theory-

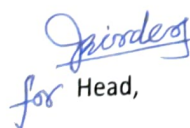
(06 Lect.)

Cantor's concept of a set, Intuitive set theory, Inclusion, Operations for sets, Algebra of sets, Ordering relations, Power sets, Numerical Equivalence of sets. Natural Number sequence, Induction and Recursion, Cardinal numbers and Cardinality, Cardinal arithmetic, Countable and Uncountable sets, Paradoxes set theory, Russell's Paradox.

Expected Number of Students = 10

Course Duration: 2 Months. Jan.19, Feb.19

Fees : Nil


for Head,
Dept. of Mathematics




Principal,

S. S. G. M. College, Kopergaon

Rayat Shikshan Sanstha's,
S.S.G.M. College, Kopargaon
Department of Mathematics
SHORT-TERM COURSE (2018-19)

Notice

Date:12/12/2018

All the students of T.Y.B.Sc .Mathematics are hereby informed that, Mathematics Department is going to start a Short Term Course --“Mathematics for Competitive Examinations”. Duration of the course is two months (Jan.2019,Feb.2019). Syllabus of the course is displayed on the notice board. The course will start on Monday 1st Jan 2019.

Interested students should give their names to Prof. D. R. Chouhan on or before 17/12/2018.

for *Spindler*
Head,

Department of Mathematics,



[Signature]
Principal,

S.S.G.M. College, Kopargaon.

Rayat Shikshan Sanstha's
Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani
Commerce College, Kopargaon, Dist.-Ahmednagar

DEPARTMENT OF MATHEMATICS

Mathematics For Competitive Examination
YEAR 2018-2019

Sr. No.	Name of the Teacher	Topics Taught
1	Mrs. D.R.Chouhan	Chapter-III Abstract Algebra (06 Lectures) Group, Subgroup, Cyclic group, Normal subgroup, Lagrange's theorem, Permutation group, Quotient group, Homomorphism's and Isomorphism
2	Miss.B.R.Tambe	Chapter-IV Metric Spaces (06 Lectures) Metric spaces, Open and Closed sets, Interior points, Closure of a set, Convergent sequence, Cauchy sequences, Complete spaces, Dense set, compactness, Connectedness
3	Mr. R.J.Ukirde	Chapter-I Real Analysis (08 Lectures) Sequence and series of real numbers, Limit, Continuity, Differentiation, Mean Value Theorems, Partial Derivatives and Euler's theorem, Convergence and divergence, Cauchy sequences, Tests of convergence, Alternate series and their convergence
4	Miss.B.R.Tambe	Chapter-II Linear Algebra (08 Lectures) Matrix Algebra and System of Linear equations, Vector spaces, Linear Dependence, Basis, Dimension, Linear Transforms, Rank-Nullity theorem, Eigen values and Eigen vectors, Cayley-Hamilton theorem, Diagonalization of matrices, Hermitian and skew hermitian matrices.
5	Mrs. D.R.Chouhan and Mr. R.J.Ukirde	Chapter-V Basics of Set Theory (06 Lectures) Cantor's concept of a set, Intuitive set theory, Inclusion, Operations for sets, Algebra of sets, Ordering relations, Power sets, Numerical Equivalence of sets. Natural Number sequence, Induction and Recursion, Cardinal numbers and Cardinality, Cardinal arithmetic, Countable and Uncountable sets, Paradoxes set theory, Russell's Paradox



[Signature]
for Head
 Dept. of Mathematics

[Signature]
Chairman
 Short Term Course Committee

[Signature]
Principal
 S.S.G.M.Science, Gautam Arts and
 Sanjivani Commerce College, Kopargaon

DEPARTMENT OF MATHEMATICS
List of Students For Short-Term Course
“Mathematics For Competitive Examinations”
(2018-2019)

Sr.No.	Name of Student	Class
1.	AHER PRATIKSHA BABURAO	T.Y.B.Sc.
2.	JADHAV YOGITA SUBHASH	T.Y.B.Sc.
3.	JAGTAP PRITI BABASAHEB	T.Y.B.Sc.
4.	KAPSE SHUBHAM DAGU	T.Y.B.Sc.
5.	MORE KIRAN ARUN	T.Y.B.Sc.
6.	RAJOLE PADMAJA	T.Y.B.Sc.
7.	SABANE UJWALA PRAKASH	T.Y.B.Sc.
8.	THORAT SNEHA DINESH	T.Y.B.Sc.
9.	UGALE KAVITA SANJAY	T.Y.B.Sc.
10.	WAKCHAURE ASHWINI SUNIL	T.Y.B.Sc.

Duration of the Course : 2 Months -01st Jan.2019 to 28th Feb.19

Fees : Nil

Javale
for Head,
Department of Mathematics,
S. S. G. M. College, Kopergaon



Shirke
Principal
S.S.G.M.Science, Gautam Arts &
Sanjivani Commerce College, Kopergaon

Rayat Shikshan Sanstha's
S.S.G.M.College, Kopargaon.

Mathematics Department

Short-Term Course

"Mathematics For Competitive Examinations"

Time- Table (2018-2019)

Duration: 02 Months (Jan.19, Feb.19)

w.e.f. 01/01/2019

Hall : Department of Mathematics

Time	Monday	Tuesday	Wednesday
03.45-04.45	Ms. D. R. Chouhan	Mr. R. J. Ukirde	Ms. B. R. Tambe


for Head,

Dept. of Mathematics




Principal,

S. S. G. M. College, Kopargaon

List of Students For Short-Term Course
“Mathematics For Competitive Examinations”

(2018-2019)

Attendance

Month: Jan. 2019

SR.NO.	NAME OF STUDENT	01/01	02/01	07/01	08/01	09/01			21/01	22/01	23/01	28/01	29/01
1.	AHER PRATIKSHA BABURAO	P	P	P	P	P	P	P	P	P	P	P	P
2.	JADHAV YOGITA SUBHASH	P	P	A	P	P	P	P	P	P	A	P	P
3.	JAGTAP PRITI BABASAHEB	P	P	P	P	A	P	P	A	P	P	P	P
4.	KAPSE SHUBHAM DAGU	P	P	P	P	P	P	P	P	P	P	P	P
5.	MORE KIRAN ARUN	P	P	P	P	P	P	P	P	P	P	P	P
6.	SABANE UJWALA PRAKASH	A	P	P	P	P	P	P	A	P	P	P	P
7.	SABANE UJWALA PRAKASH	P	P	A	P	P	P	P	P	P	P	P	P
8.	THORAT SNEHA DINESH	P	P	P	A	P	P	P	P	P	A	P	P
9.	UGALE KAVITA SANJAY	P	P	P	P	P	P	P	P	A	A	P	P
10.	WAKCHAURE ASHWINI SUNIL	P	P	P	P	P	P	P	P	P	P	P	P



Sirderaj
for Head
 Department of Mathematics,
 S. S. G. M. College, Kopargadon

List of Students For Short-Term Course
“Mathematics For Competitive Examinations”
(2018-2019)

Attendance

Month: Feb. 2019

SR.NO.	NAME OF STUDENT	04/02	05/02	06/02	11/02	12/02	13/02	18/02	19/02	20/02	21/2	22/2	23/2
1.	AHER PRATIKSHA BABURAO	P	P	P	P	A	P	P	P	P	P	P	P
2.	JADHAV YOGITA SUBHASH	P	P	P	A	P	P	P	P	A	P	P	P
3.	JAGTAP PRITI BABASAHEB	P	P	P	P	P	P	P	P	P	P	P	P
4.	KAPSE SHUBHAM DAGU	P	P	A	A	P	P	P	P	A	P	P	P
5.	MORE KIRAN ARUN	P	A	P	P	A	P	P	P	P	P	P	P
6.	SABANE UJWALA PRAKASH	P	A	P	P	P	P	P	P	P	A	P	P
7.	SABANE UJWALA PRAKASH	A	A	A	P	P	P	P	P	P	A	P	P
8.	THORAT SNEHA DINESH	A	P	A	P	P	P	A	P	P	P	A	P
9.	UGALE KAVITA SANJAY	P	P	A	P	P	P	A	P	P	P	P	P
10.	WAKCHAURE ASHWINI SUNIL	P	P	P	A	P	P	P	P	P	P	P	P



Spirder
for Books
 Department of Mathematics,
 S. S. G. M. College, Kopergaon.

Rayat Shikshan Sanstha's,
S. S. G. M. COLLEGE KOPARGAON
Department of Mathematics

Short Term Course, 2018-2019

Sub: Mathematics for Competitive Examinations

Test

Day & Date: Tuesday, 07/03/2019

Time: 3.45 pm To 4.45 pm [1.00 Hr]

Max. Marks: 50

Note: 1) Attempt *all* the questions. *Each* question carries 2 marks.

1.

Define $f_1, f_2: [0,1] \rightarrow \mathbb{R}$ by

$$f_1(x) = \sum_{n=1}^{\infty} \frac{x \sin(n^2 x)}{n^2} \quad \text{and} \quad f_2(x) = \sum_{n=1}^{\infty} x^2 (1 - x^2)^{n-1}.$$

Then

- (A) f_1 is continuous but f_2 is NOT continuous
- (B) f_2 is continuous but f_1 is NOT continuous
- (C) both f_1 and f_2 are continuous
- (D) neither f_1 nor f_2 is continuous

2.

The system of linear equations

$$x - y + 2z = b_1$$

$$x + 2y - z = b_2$$

$$2y - 2z = b_3$$

is inconsistent when (b_1, b_2, b_3) equals

- (A) $(2, 2, 0)$ (B) $(0, 3, 2)$ (C) $(2, 2, 1)$ (D) $(2, -1, -2)$

3.

Let $x_n = 2^{2^n} \left(1 - \cos \left(\frac{1}{2^n} \right) \right)$ for all $n \in \mathbb{N}$. Then the sequence $\{x_n\}$

- (A) does NOT converge (B) converges to 0
(C) converges to $\frac{1}{2}$ (D) converges to $\frac{1}{4}$

4.

The set $\left\{ \frac{x^2}{1+x^2} : x \in \mathbb{R} \right\}$ is

- (A) connected but NOT compact in \mathbb{R} (B) compact but NOT connected in \mathbb{R}
(C) compact and connected in \mathbb{R} (D) neither compact nor connected in \mathbb{R}

5.

Let $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ be two series, where $a_n = \frac{(-1)^n n}{2^n}$, $b_n = \frac{(-1)^n}{\log(n+1)}$ for all $n \in \mathbb{N}$. Then

- (A) both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ are absolutely convergent
- (B) $\sum_{n=1}^{\infty} a_n$ is absolutely convergent but $\sum_{n=1}^{\infty} b_n$ is conditionally convergent
- (C) $\sum_{n=1}^{\infty} a_n$ is conditionally convergent but $\sum_{n=1}^{\infty} b_n$ is absolutely convergent
- (D) both $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ are conditionally convergent

6.

For all $(x, y) \in \mathbb{R}^2$, let $f(x, y) = \begin{cases} x & \text{if } y = 0, \\ x - y^3 \sin(1/y) & \text{if } y \neq 0. \end{cases}$

Then at the point $(0, 0)$,

- (A) f is NOT continuous
- (B) f is continuous but NOT differentiable
- (C) $\frac{\partial f}{\partial x}$ exists but $\frac{\partial f}{\partial y}$ does NOT exist
- (D) f is differentiable

7.

The value of $\int_{x=0}^1 \int_{y=0}^{x^2} \int_{z=0}^y (y+2z) dz dy dx$ is

- (A) $\frac{1}{53}$
- (B) $\frac{2}{21}$
- (C) $\frac{1}{6}$
- (D) $\frac{5}{3}$

8.

Let G be a cyclic group of order 24. The total number of group isomorphisms of G onto itself is

- (A) 7
- (B) 8
- (C) 17
- (D) 24

9.

Which of the following groups contains a unique normal subgroup of order four?

- (A) $\mathbb{Z}_2 \oplus \mathbb{Z}_4$
- (B) The dihedral group, D_4 , of order eight
- (C) The quaternion group, Q_8
- (D) $\mathbb{Z}_2 \oplus \mathbb{Z}_2 \oplus \mathbb{Z}_2$

10.

Let S be the oriented surface $x^2 + y^2 + z^2 = 1$ with the unit normal \mathbf{n} pointing outward. For the vector field $\mathbf{F}(x, y, z) = x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$, the value of $\iint_S \mathbf{F} \cdot \mathbf{n} \, dS$ is

- (A) $\frac{\pi}{3}$ (B) 2π (C) $\frac{4\pi}{3}$ (D) 4π

11.

The value of $\iint_R xy \, dx \, dy$, where R is the region in the first quadrant bounded by the curves $y = x^2$, $y + x = 2$ and $x = 0$ is _____

12.

The radius of convergence of the power series $\sum_{n=0}^{\infty} 4^{(-1)^n n} z^{2n}$ is _____

13.

Let

$$f(x, y) = \begin{cases} \frac{2(x^3 + y^3)}{x^2 + 2y}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0). \end{cases}$$

Show that the first order partial derivatives of f with respect to x and y exist at $(0, 0)$. Also show that f is not continuous at $(0, 0)$.

14.

Evaluate

$$\int_{1/4}^1 \int_{\sqrt{x-x^2}}^{\sqrt{x}} \frac{x^2 - y^2}{x^2} \, dy \, dx$$

by changing the order of integration.

15.

Let $\vec{F} = 2z\hat{i} + 4x\hat{j} + 5y\hat{k}$, and let C be the curve of intersection of the plane $z = x + 4$ and the cylinder $x^2 + y^2 = 4$, oriented counter-clockwise. The value of $\oint_C \vec{F} \cdot d\vec{r}$ is

16.

The set of points at which the function $f(x, y) = x^4 + y^4 - x^2 - y^2 + 1$, $(x, y) \in \mathbb{R}^2$ attains local maximum is

17.

Let $u = \frac{y^2 - x^2}{x^2 y^2}$, $v = \frac{z^2 - y^2}{y^2 z^2}$ for $x \neq 0$, $y \neq 0$, $z \neq 0$. Let $w = f(u, v)$, where f is a real valued function defined on \mathbb{R}^2 having continuous first order partial derivatives. The value of $x^3 \frac{\partial w}{\partial x} + y^3 \frac{\partial w}{\partial y} + z^3 \frac{\partial w}{\partial z}$ at the point $(1, 2, 3)$ is

18.

The orthogonal trajectory of the family of curves $\frac{x^2}{2} + y^2 = c$, which passes through (1, 1) is

19.

The function to which the power series $\sum_{n=1}^{\infty} (-1)^{n+1} n x^{2n-2}$ converges is

20.

The value of $\frac{i}{4-\pi} \int_{|z|=4} \frac{dz}{z \cos(z)}$ is equal to _____

21.

Find all the critical points of the function $f: \mathbb{R}^2 \rightarrow \mathbb{R}$ defined by $f(x, y) = x^3 + xy + y^3$ for all $(x, y) \in \mathbb{R}^2$. Also, examine whether the function f attains a local maximum or a local minimum at each of these critical points.

22.

Consider the following linear programming problem:

$$\begin{array}{ll} \text{Maximize} & x + 3y + 6z - w \\ \text{subject to} & 5x + y + 6z + 7w \leq 20, \\ & 6x + 2y + 2z + 9w \leq 40, \\ & x \geq 0, y \geq 0, z \geq 0, w \geq 0. \end{array}$$

Then the optimal value is _____

23.

Let M be the real vector space of 2×3 matrices with real entries. Let $T: M \rightarrow M$ be defined by

$$T\left(\begin{bmatrix} x_1 & x_2 & x_3 \\ x_4 & x_5 & x_6 \end{bmatrix}\right) = \begin{bmatrix} -x_6 & x_4 & x_1 \\ x_3 & x_5 & x_2 \end{bmatrix}.$$

The determinant of T is _____

24.

Let $D = \{(x, y) \in \mathbb{R}^2: 1 \leq x \leq 1000, 1 \leq y \leq 1000\}$. Define

$$f(x, y) = \frac{xy}{2} + \frac{500}{x} + \frac{500}{y}.$$

Then the minimum value of f on D is equal to _____

25.

Let M be the space of all 4×3 matrices with entries in the finite field of three elements. Then the number of matrices of rank three in M is


- (A) $(3^4 - 3)(3^4 - 3^2)(3^4 - 3^3)$
- (B) $(3^4 - 1)(3^4 - 2)(3^4 - 3)$
- (C) $(3^4 - 1)(3^4 - 3)(3^4 - 3^2)$
- (D) $3^4(3^4 - 1)(3^4 - 2)$

Result of Examination conducted For Short-Term Course

“Mathematics For Competitive Examinations”

(2018-2019)

Sr.No.	Name of Student	Class	Marks
1.	AHER PRATIKSHA BABURAO	T.Y.B.Sc.	36
2.	JADHAV YOGITA SUBHASH	T.Y.B.Sc.	48
3.	JAGTAP PRITI BABASAHEB	T.Y.B.Sc.	50
4.	KAPSE SHUBHAM DAGU	T.Y.B.Sc.	40
5.	MORE KIRAN ARUN	T.Y.B.Sc.	48
6.	RAJOLE PADMAJA	T.Y.B.Sc.	38
7.	SABANE UJWALA PRAKASH	T.Y.B.Sc.	40
8.	THORAT SNEHA DINESH	T.Y.B.Sc.	50
9.	UGALE KAVITA SANJAY	T.Y.B.Sc.	50
10.	WAKCHAURE ASHWINI SUNIL	T.Y.B.Sc.	42


Head,

Dept. of Mathematics




Principal,

S. S. G. M. College, Kopargaon

DEPARTMENT OF MATHEMATICS

Report of Short-Term Course

“Mathematics For Competitive Examinations”

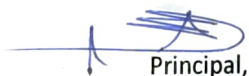
(2018-2019)

The Department of Mathematics has conducted a Short Term Course on “Mathematics For Competitive Examinations”. The duration of the course was 2 months (January 2019-February 2019). Lectures were taken by the faculties of the Department. 10 students of T. Y. B. Sc have participated in this course. This course was conducted free for the students. Overall performance of the students was evaluated on the basis of 50 marks exam which was objective type containing 25 questions each carrying 2 marks. 3 students have scored 100 % marks.


for Head,

Dept. of Mathematics




Principal,

S. S. G. M. College, Kopergaon

“EDUCATION THROUGH SELF - HELP IS OUR MOTTO” - Karmaveer

Rayat Shikshan Sanstha's



**Shri Sadguru Gangageer Maharaj Science,
Gautam Arts & Sanjivani Commerce College**

Kopargaon, Dist. Ahmednagar (M.S.)



Certificate of Completion
Short Term Course

This is to Certify that Shri/Kum. _____

of Class _____ has Completed Short Term Course in _____

_____ conducted by the department of _____

during the academic year 201 /201

Course Co-ordinator

Co-ordinator

Principal

Rayat Shikshan Santha's
Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani Commerce College,
Kopargaon, Dist- Ahmednagar- 423601, (M.S) India

Department of Mathematics

Short Term Course: Mathematics For Competitive Examination
2018-19

Feedback form

Class: T.Y.BSc

Date: 23/02/2019

Name of the student: Ugale Kavita Sanjay

About the Course Information on the Respondent: (Tick (✓) Appropriate Option)

Questionaries		Excellent A	Very Good B	Good C	Satisfactory D	Poor E
1.	Quality of the Teaching/lecture		✓			
2.	Were objectives of the course clear to you?			✓		
3.	The course contents compared with your expectations?				✓	
4.	Level of preparation			✓		
5.	Overall evaluation of the course		✓			
6.	Level of Interaction			✓		


Sign of the Student

Rayat Shikshan Santha's
Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani Commerce College,
Kopargaon, Dist- Ahmednagar- 423601, (M.S) India

Department of Mathematics

Short Term Course: Mathematics For Competitive Examination
2018-19

Feedback form

Class: T. Y. B.Sc.

Date: 23/02/2019

Name of the student: Aheer Pratiksha Baburao

About the Course Information on the Respondent: (Tick (✓) Appropriate Option)

Questionaries		Excellent A	Very Good B	Good C	Satisfactory D	Poor E
1.	Quality of the Teaching/lecture	✓				
2.	Were objectives of the course clear to you?		✓			
3.	The course contents compared with your expectations?	✓				
4.	Level of preparation		✓			
5.	Overall evaluation of the course	✓				
6.	Level of Interaction		✓			


Sign of the Student

Rayat Shikshan Santha's
Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani Commerce College,
Kopargaon, Dist- Ahmednagar- 423601, (M.S) India

Department of Mathematics

Short Term Course: Mathematics For Competitive Examination

2018-19

Feedback form

Class: TY BSC

Date: 23/02/2019

Name of the student: Mure Kiran Anjan

About the Course Information on the Respondent: (Tick (✓) Appropriate Option)

Questionaries		Excellent A	Very Good B	Good C	Satisfactory D	Poor E
1.	Quality of the Teaching/lecture	✓				
2.	Were objectives of the course clear to you?	✓				
3.	The course contents compared with your expectations?			✓		
4.	Level of preparation	✓				
5.	Overall evaluation of the course		✓			
6.	Level of Interaction		✓			



Sign of the Student