

SSCB-301
M.A./M.Sc. IIIrd Semester
(Reg./Pvt./ATKT) Examination, 2020

Paper – I (Compulsary)

Functional Analysis - I

[Maximum Marks : Reg. 85

Pvt.100

Note :- All questions from each section carry equal marks. All questions are compulsory and answer limit are approximately 250 words. Start the answer of each section from new page. Maximum limit of pages of answer booklet are approximately 16 pages. Answer should be written by the student in his/her own handwriting mandatory. The first page of answersheet should be download by the student from university website www.bubhopal.ac.in is mandatory.

1. Define linear space and write the basic properties of normed linear space.
2. State and prove Riesz lemma.
3. Explain
 - (i) Linear Operator
 - (ii) Bounded Linear Operator.
4. State and prove Cauchy's Square and Inequalities Theorem.
5. Define Hilbert space with an appropriate example. State and prove Hilbert Basis Theorem.

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December - 2020

M.A./M.Sc IIIrd Sem Mathematics (Reg/Pvt/Atkt/Ex)

Paper - I

Partial Differential Equations - I

{ Reg - 85
{ Pvt - 100

Note:- Attempt in all five questions.
Each question carry equal marks.

Ques-1 Explain Properties of harmonic function

Ques-2 Derive the solution of Laplace equation
in cylindrical coordinates

Ques-3 Derive the solution of diffusion equation
in spherical coordinates

Ques-4 Explain D'Alembert's Solution

Ques-5 Find the periodic solution of one
dimensional wave equation in
spherical polar coordinates.

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EXAMINATION - December [2020]

M.A./MSC III Semester Mathematics [Reg/ATKT/PVT/EX]

Paper III

Advance Graph theory I

[Optional III]

Max-Marks

Reg - 85

Pvt = 100

1. Define Isomorphism of graph, subgraphs with Example.
2. Given an example of traveling salesman problem and show how it works
3. Define:-
 - a. Spanning trees in a weighted graph.
 - b. Binary trees.
 - c. Fundamental circuits
4. Explain the difference between
 - a. Connectivity and separability
 - b. Fundamental circuits and cut-sets
5. What are different Representations of a planar graph. Explain

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December - 2020 .

M.A./M.Sc IIIrd semester Mathematics

(REG/PVT/ATKT/EX)

Paper - VIII

Operation Research - I

$\left\{ \begin{array}{l} \text{max-Reg-85} \\ \text{PVE-100} \end{array} \right.$

Note:- Attempt in all five question. Each question carry equal marks.

Ques-1

Define operation Research and Explain Scope of operation Research and Tools of O.R.

Ques-2 A company produces two product A and B which possess raw materials 400 quintals and 450 labour hour. It is known that 1 unit of product A requires 5 quintals of raw materials and 10 man hours and yields a profit of Rs. 45/- Product B. requires 20 quintals of raw materials, 15 man hours and yields a profit of Rs. 80/- Formulation the LPP.

Ques solve graphically

$$\text{Max } Z = 45x_1 + 80x_2$$

$$\text{subject to. } 5x_1 + 20x_2 \leq 400$$

$$10x_1 + 15x_2 \leq 450 .$$

$$x_1 \geq 0, x_2 \geq 0$$

Ques 4 solve by BIG-M method

Minimize $z = 2x_1 + 3x_2$
subject to constraints .

$$x_1 + x_2 \geq 5$$

$$x_1 + 2x_2 \geq 6$$

$$x_1, x_2 \geq 0$$

Ques - 5 state and Prove Duality theorems

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Examination - December - 2020

M.A./M.Sc III Semester Mathematics (Reg/PVT/ATKT/EX)

And INTEGRAL TRANSFORM - I

OPTIONAL - X.

Max-Marks
Reg = 85
Pvt = 100

Q.1 State and Prove Shifting theorem?

Q.2. $Dx + Dy = t$

$$D^2x - y = e^{-t}$$

g) $x(0) = 3, x'(0) = -2, y(0) = 0$

Q.3 = What is Wave Equation in one dimension.

Find the Solution of the Equation

$$\frac{\partial^2 u}{\partial t^2} = k \frac{\partial^2 u}{\partial x^2} \text{ which tends to zero as } x \rightarrow \infty$$

and which suffices the conditions

$$u = f(t) \text{ when } x = 0, t > 0$$

$$\text{and } u = 0 \text{ when } x > 0, t = 0$$

Q.4 A beam which is hinged at its ends $x=0$ and $x=1$ carries a uniform load W_0 per unit length. Find the deflection at any point.

Q.5. Define Heat Conduction Equation

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EXAMINATION - 2020

M.A./M.Sc III - Semester

Advance Special Function I

Optional IV

Max Marks

Reg = 85

MT = 100

Q.1 State and prove Legendre's Duplication Formula.

Q.2 If $|z| < 1$ and if $\operatorname{Re}(c) > \operatorname{Re}(b) > 0$

Show that ${}_2F_1 \left[\begin{matrix} a, b \\ c \end{matrix}; z \right]$

$$= \frac{\Gamma(c)}{\Gamma(b)\Gamma(c-b)} \int_0^1 t^{b-1} (1-t)^{c-b-1} (1-zt)^{-a} dt$$

OR

$${}_2F_1 \left[\begin{matrix} a, b \\ c \end{matrix}; 1 \right] = \frac{\Gamma(c)\Gamma(c-a-b)}{\Gamma(c-a)\Gamma(c-b)}$$

3- State and prove Dixon's theorem for generalized hypergeometric function

4 Explain Briefly about Elementary Series Manipulations, Simple Transformations.

5- What is confluent hypergeometric function and define two of its properties.

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December - 2020.

M.A/M.Sc IIIrd semester (Mathematics)

(Reg/Pvt /Atkt /Ex)

Paper - XIII

Spherical trigonometry and Astronomy - I

{ max marks
{ Reg - 85
{ Pvt. - 100

Note:- Attempt in all five question. Each question carry equal marks.

Ques 1 In a spherical triangle ABC Prove that
 $\pi < A+B+C < 3\pi$

Ques 2 Establish the sine formula in spherical triangle ABC

Ques-3 If $b+c = \pi$ then Prove that
 $\sin 2B + \sin 2C = 0$

Ques-4 In a spherical triangle ABC, Prove that-

$$\tan\left(\frac{A-a}{2}\right) \tan\left(\frac{B+b}{2}\right) = \tan\left(\frac{B-b}{2}\right) \tan\left(\frac{A+a}{2}\right)$$

Ques-5 Convert the Co-ordinate system
right ascension and declination into
the longitude and latitude system i.e
~~(α, δ)~~ (α, δ) into (λ, β) .

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December - 2020.

M.A/M.Sc IIIrd sem (Mathematics)
(Reg/Pvt/ATKT/EX)

Paper - V

Theory of linear operators - I

{ max marks
Reg - 85
Pvt - 100

Note:- Attempt in all five question.
Each question carry marks equal.

Ques-1 A linear operator on a finite dimensional complex ~~method~~ normed space $X \neq \{0\}$ has at least one eigen value.

Ques-2 state and Prove Representation theorem

Ques-3 state and Prove Schur's inequality

Ques-4 state and Prove Compactness Criterion

Ques-5 Show that metric space X is compact iff it is complete and totally bounded.

**Barkatullah University (Open Book) ATKT Examination,
December - 2020**

M.A./M.Sc. IIIrd Semester Mathematics

Paper: Advanced Programming in 'C' (OPT.)

Max. Marks: 85

Note :- Attempt all questions:

1. What is user defined function in C? Explain user defined function with the help of example.
2. Write a program to compare two strings.
3. What is Union in C language? Write difference between Union and Structure in C.
4. Explain declaring and initializing pointer with the help of an example.
5. Explain error handling during I/O operations on file.