Janki Devi Bajaj Government Girls College, Kota

Sample Paper

M.Sc. (Mathematics) Semester -IV

Paper-Math 4 C(iv) (Functional Analysis-II)

Max Marks-15

There are five questions; students are instructed to attempt three questions. Each question shall be of five marks.

1. State and prove open mapping theorem.

2. Prove that every inner product space is a normed linear space .

3. Let N and N' be normed linear space with the same scalars and let

   T:N→N' be linear transformation. Then prove that T is bounded ⇔T is

   continuous.

4. Let S be non-empty subset of a Hilbert space H ,then show that $S^{\perp}$ is a

   closed linear subspace of H .

5. Let H be a Hilbert Space ,then show that conjugate space H^{*} is also a

   Hilbert space with respect to the inner product defined by $(f_x, f_y) = (y, x)$.

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Sample Paper

M.Sc. (Mathematics) Semester -IV

Paper-Math 4 C(vii) (Topology-II)

Max Marks-15

There are five questions; students are instructed to attempt three questions. Each question shall be of five marks.

1. Prove that the product spaces $X*Y$ is connected if and only if X and Y are connected .

2. Prove that a subset F, of R is connected if and only if it is an interval .Is R connected? Justify the answer.

3. Prove that a topological space (X,T) is compact if and only if each net in X has a cluster point.

4. prove that A net in a set X is ultranet if and only if the filter it generates is an ultrafilter.

5. If (X,T) be a topological space and let $Y \subset X$ then prove that Y is T-closed if and only if no net in Y converges to a point in X-Y.

Max Marks-15

There are five questions; students are instructed to attempt three questions. Each question shall be of five marks.

1. Find maximum value of y_1, y_2, y_3

$$\text{Subject to } y_1 + y_2 + y_3 = 15$$

$$\text{and } y_1, y_2, y_3 \geq 0$$

2. Use Dynamic programming to solve the following L.P.P

$$Max\ z = 2x_1 + 5x_2$$

$$\text{s.t.} \quad 2x_1 + x_2 \leq 43$$

$$2x_2 \leq 46$$

$$and \quad x_1, x_2 \geq 0$$

3. Find the maximum or minimum value of the function:

$$x_1^2 + x_2^2 + x_3^2 \text{-} 4x_1 - 8x_2 - 12x_3 + 56$$

4. Use the K-T conditions to solve the following NLPP:

$$Min\ z = -8x_1 - 10x_2 + x_1^2 + x_2^2$$

$$\text{s.t.} \quad 3x_1 + 2x_2 \leq 6$$

$$and \quad x_1, x_2 \geq 0$$

5. Use Beale's method to solve the following QPP:

$$Min\ z = 10x_1^2 + x_2^2 + 4x_1x_2 - 10x_1 - 25x_2$$

$$\text{s.t.} \quad x_1 + 2x_2 \leq 10$$

$$x_1 + x_2 \leq 9$$

$$and \quad x_1, x_2 \geq 0$$

Sample Paper

M.Sc. (Mathematics) Semester -IV

Paper-Math 4 O(iv) (Fluid Dynamics)

Max Marks-15

There are five questions; students are instructed to attempt three questions. Each question shall be of five marks.

1. To show that a sphere projected in a liquid under gravity describes a parabola of latus-rectum $\frac{2\sigma+\rho}{\sigma-\rho} \times \frac{W^2}{g}$, where σ and ρ are the densities of the sphere and the liquid and W is the horizontal velocity.

2. Write a short note on Image of a doublet in front of a sphere.

3. Discuss the motion for which Stoke's stream function is given by

$$\Psi = \left(\frac{V}{2}\right) \times (a^4 r^{-2} cos\theta - r^2) \sin^2 \theta,$$

where r is the distance from a fixed point and θ is the angle this distance make with the fixed direction.

4. Define Vortex dipole.

5. An infinite row of equidistant rectilinear vortices is at a distance an apart. The vortices are of the same numerical strength k but they are alternately of opposite signs. Find the complex function that determines the velocity potential and the stream function.

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Sample Paper

M.Sc. (Mathematics) Semester -I

Paper-Math 4 O(iii) (Mathematical Statistics)

Max Marks-15

There are seven questions; students are instructed to attempt five questions. Each question shall be of three marks.

1. A sample of 900 members has a $mean\ 3.4\ cms.$ and $s.d.\ 2.61\ cms.$ Is the sample from a large population of $mean\ 3.25\ cms.$ and $s.d.\ 2.61\ cms.$? Is the population is normal and its mean is unknown, find the 95% and 98% fiducial limit for true mean.

2. Write a short note on method of minimum Chi-square.

3. The life expectancy of people in the year 1970 in India is expected to be 50 years. A survey was conducted in eleven regions of India and the data obtained are given below. Do the data confirm the expected view ?

Life expectancy (years):	54.2	50.4	44.2	49.7	55.4	57.0
	58.2	56.6	61.9	57.5	53.4	

4. Write a short note on distribution of order statistics.

5. Let $x_1, x_2, \ldots, x_n$ denote random sample of size n from a uniform population with p.d.f :

$$f(x, \theta) = 1; \theta - \frac{1}{2} \le x \le \theta + \frac{1}{2}, -\infty < \theta < \infty \qquad \text{obtain}$$

M.L.E. for θ.

6. A machine produced 20 defective articles in a batch of 400. After overhauling it produced 10 defectives in a batch of 300. Has the machine improved?

7. Write a short note on estimation.