

**J.D.B Govt. Girls College, Kota**  
**Sample Question Paper**  
**B.Sc. Part I**  
**P-I Abstract Algebra**

Max. Marks-10

Q.1 Attempt all questions(each question for 01 marks)

- (a) State Chinese remainder theorem(चीनी शेषफल प्रमेय का कथन लिखो।)
- (b) Define semi-group (सामिसमूह- को परिभाषित कीजिए।)
- (c) Define complex of a group(एक ग्रुप के कॉम्प्लेक्स को परिभाषित कीजिए।)
- (d) Define Index of a subgroup( उपग्रुप के सूचकांक को परिभाषित कीजिए।)
- (e) Define Hamiltonian group.(हेमिल्टनी समूह को परिभाषित कीजिए।)

Q.2 Short answer questions (each question for 02 marks)

(a) Prove that  $H$  is a subgroup of the group  $(C_0, \times)$  where:

सिद्ध कीजिए कि  $H$  समूह  $(C_0, \times)$  का एक उपसमूह है जहाँ:

$$H = \{a + b\sqrt{2} : a \in \mathbb{Q}, b \in \mathbb{Q}, a^2 + b^2 \neq 0\}$$

- (b) Show that every permutation can be expressed as the product of disjoint cycles. सिद्ध कीजिए कि प्रत्येक क्रमचय असंयुक्त चक्रों के गुणनफल के रूप में व्यक्त किया जा सकता है।
- (c) State Fundamental theorem on homomorphism  
समाकारिता कि मूलभूत प्रमेय का कथन
- (d) Show that the characteristic of an integral domain is either zero or a prime number. सिद्ध करो कि किसी पूर्णाकीय प्रांत का अभिलक्षण या तो शून्य होता है या अभाज्य संख्या
- (e) Show that the intersection of two ideals of a ring is again an ideal of the ring.  
सिद्ध करो कि किसी वलय की दो गुणजावलियों का सर्वनिष्ठ भी उस वलय की गुणजावली होती है।

Q.3 Descriptive Questions (05 marks)

(a) Show that the alternating group  $A_n$  of all even permutations of degree  $n$  is a normal subgroup of the symmetric group  $S_n$ .

सिद्ध कीजिए कि  $n$  अंशांक के सभी सम क्रमचयों का एकान्तर समूह  $A_n$ , सममित समूह  $S_n$  का प्रसामान्य उपसमूह होता है।

**Janki Devi Bajaj Government Girls College, Kota**

**Sample Question Paper**

**B.Sc. Part I**

**P-II Differential Calculus and Integral Calculus**

Max. Marks-10

Q.1 Attempt all questions

- (a) Define the Evolutes.
- (b) Write radius of curvature for polar equations.
- (c) Define Dirichlet's integrals.
- (d) Define Liouville's extension of the Dirichlet's integrals.
- (e) Find  $\int_0^h \int_0^{h-x} \int_0^{h-x-y} x^{l-1} y^{m-1} z^{n-1} f(x, y, z) dx dy dz$ . If  $x + y + z \leq h$  and  $x, y, z > 0$

Q.2 Short answer questions

- (a)  $\iiint xyz dx dy dz$ , where the region of integration is the volume of the ellipsoid in the positive octant.

(b) evaluate  $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$

- (c) write formula for length of chord of curvature parallel to the axes.

(d) Prove that for the cardioid

(i)  $\rho \propto \sqrt{r}$       (ii)  $9(\rho_1^2 + \rho_2^2) = 16 a^2$

(e) If the pedal equation of an ellipse be

$$\frac{1}{\rho^2} = \frac{1}{a^2} + \frac{1}{b^2} - \frac{r^2}{a^2 b^2}$$

Then find the value of radius of curvature at a point

Q.3 Descriptive Questions

(a) For the curve  $r^n = a^n \cos n\theta$  find the value of

- (i) Radius of curvature
- (ii) Length of chord passing through origin
- (iii) Distance between centre of curvature and pole

**Janki Devi Bajaj Government Girls College, Kota**  
**Sample Question Paper**  
**B.Sc. Part I**  
**P-III 2D 3D and vector Analysis**

Max. Marks-10

Q.1 Attempt all questions

- (a) Define the Enveloping cone.
- (b) Define the Enveloping cylinder.
- (c) Define normal.
- (d) Define ellipsoid.
- (e) Define the Conjugate diameters.

Q.2 Short answer questions

- (a) Find the locus of the mid points of the parallel chords of an ellipsoid.
- (b) Find the equations of the normal at the point  $(x, y, z)$  to the ellipsoid

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$$

- (c) Find the equation of the enveloping cylinder of the conicoid

$$ax^2 + by^2 + cz^2 = 1, \text{ whose generators are parallel to the line } \frac{x}{l} = \frac{y}{m} = \frac{z}{n}$$

- (d) Find the locus of the middle point of a system of chords of the conicoid

$$ax^2 + by^2 + cz^2 = 1 \text{ which are parallel to the line } \frac{x}{l} = \frac{y}{m} = \frac{z}{n}$$

- (e) Show that the centres of sections of a central conicoid that pass-through a given line on a conic.

Q.3 Descriptive Questions

- (a) Find the equation of conjugate semidiameters and conjugate diametral plane of the ellipsoid.