

Mayoor School, Ajmer

Mathematics/XI/Annual Examination/Monday/March 2, 2009

MM:100

(Time Allowed: 3 hours)

XI Sc: HSK

VKJ:80

XI Comm :VKJ

General Instructions:

- 1) All questions are compulsory.
- 2) The question paper consists of 29 questions divided into three sections A, B and C. Section A comprises of 10 questions of one mark each, section B comprises of 12 questions of four marks each. Section C comprises of 07 questions of six marks each.
- 3) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- 4) There is no overall choice. However internal choices have been provided in 04 questions of four marks each and 02 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- 5) Use of calculators is not permitted.

SECTION A

- Q1) Find the conjugate of the complex number: $-i - (-1)$.
- Q2) Find the value of k for which $-\frac{2}{7}, k, -\frac{7}{2}$ are in the G. P.
- Q3) Find the solution of $3x^2 + 2 = 0$ over the complex numbers.
- Q4) What is the value of $\cos\left(\frac{\pi}{4} - x\right) \cos\left(\frac{\pi}{4} - y\right) - \sin\left(x - \frac{\pi}{4}\right) \sin\left(\frac{\pi}{4} - y\right)$?
- Q5) What is the eccentricity of the curve $4x^2 + y^2 = 100$
- Q6) What is the mean of first n natural numbers?
- Q7) Find median of the following data: 1, 2, 3, 4, 5, 6.
- Q8) State whether the following is statement or not: 6 has three prime factors.
- Q9) State whether the following is statement or not: 1 is a prime number.
- Q10) Write truth table for 'p and q', where p, q are statements.

SECTION B

- Q11) Write the complex number in the polar form : $\frac{1+7i}{(2-i)^2}$

Or

If $(x + iy)^3 = u + iv$, then show that $\frac{u}{x} + \frac{v}{y} = 4(x^2 - y^2)$

- Q12) Prove by principle of mathematical induction that $5^n - 5$ is divisible by 4 for all $n \in N$.
- Q13) A committee of 8 students is to be selected from 8 boys and 6 girls. In how many ways this can be done if each group is to consists of at least 3 boys and 3 girls.
- Q14) In how many of distinct permutations of the letters in MISSISSIPPI do the four I's not come together?
- Q15) Let $A = \{1, 2, 3, \dots, 19, 20\}$. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$. Write R in roster form and hence find its domain, range and co domain.
- Q16) Find domain and range of $f(x) = \frac{x^2}{x^2 + 1}$
- Q17) Find $\sin \frac{x}{2}$, $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ if $\tan x = -\frac{4}{3}$ where x lies in II quadrant.
- Q18) Solve the equation for general solution: $2\sin^2 x + \sin^2 2x = 2$
- Q19) The vertices of the triangle are A(2, 3), B(4, -1) and C(1, 2). Find the length and equation of the perpendicular drawn from the point A on the side BC.

OR

Find the equation of the line passing through the point (2, 2), such that the sum of the intercepts on the axes is 9

- Q20) Find the equation of the circle whose centre is on the line $2x - y = 3$ and which passes through (3, -2) and (-2, 0).
- Q21) For the following curve, find the focus, axis, vertex and length of the latus rectum:
 $x^2 = -16y$.

Or

Show that the points (-2, 6, -2), (0, 4, -1), (-2, 3, 1) and (-4, 5, 0) are vertices of a square.

- Q22) In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both. If one student is selected at random, find the probability that

- (i) The student opted for NCC or NSS.
 (ii) The student has opted neither NCC nor NSS.

Or

Four cards are drawn from a pack of 52 cards. What is the probability of getting 3 diamonds and one spade? Also find the probability that two cards are red and two are black.

SECTION C

Q23) Solve the following system of inequations graphically:

$$3x - y \leq 10, \quad x + y \leq 6, \quad x - y \leq 2, \quad x \geq 0, \quad y \geq 0$$

Q24) The sum of two numbers is 6 times their geometric mean, show that the numbers are in the ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$.

Or

Find the sum of the series up to n terms: $5 + 11 + 19 + 29 + 41 + \dots$

Q25) If the coefficient of the $(r-1)^{\text{th}}$, r^{th} and $(r+1)^{\text{th}}$ terms in the expansion of $(1+x)^n$ are in the ratio 1:7:42. Find n and r .

Or

The second, third and fourth terms in the expansion of $(x + y)^n$ are 240, 720, and 1080 respectively. Find the values of x , y and n .

Q26) Prove that $\frac{\sin A - \sin 3A + \sin 5A - \sin 7A}{\cos A - \cos 3A - \cos 5A + \cos 7A} = \cot 2A$

Q27) Calculate standard deviation for the following data:

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	5	8	15	16	6

Q28) (i) Find the derivative of $f(x) = \cos x$, using first principle.

(ii) Evaluate: $\lim_{x \rightarrow 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$

Q29-a) If $A = \{1, 2, 3, 4, 5\}$, $B = \{1, 3, 5, 8\}$, $C = \{2, 5, 7, 8\}$,

Verify that $A - (B \cup C) = (A - B) \cap (A - C)$

Q29-b) (i) Write all the possible subsets of the set $A = \{a, b, c, d\}$

(ii) In a group of 50 persons, 14 drink tea but not coffee and 30 drink tea. Find

How many drink tea and coffee both? How many drink coffee but not tea?