

## Half-yearly Examination - 2016-2017

### MATHEMATICS

Time : 3 Hrs. 15 min

Std. : XI

F. M. : 100

(Candidates are allowed additional 15 minutes for only reading the paper.

They must NOT start writing during this time)

The Question paper consists of three Sections A, B and C.

Candidates are required to attempt all questions from Section A and all questions either from Section B or Section C

(All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.

The intended marks for questions or parts of questions are given in brackets ( )

#### Section (80 Marks)

#### Section A (80 Marks)

- i) A survey was conducted of the I V programme watched by 120 students of a school hostel. It was learnt that 70 students watched discovery channel and 56 watched ESPN channel 24 watched both programmes . Find the no of students who did not watch T V programme on that day. [2]
- ii) Find x and y if  $\frac{x+iy}{2-i} = \frac{1+i}{2+i}$  [2]
- iii) Prove that the equation  $x^2 - 2ax + a^2 - b^2 - c^2 = 0$  are always real a, b and c are real [2]
- iv) Prove that  $\frac{\sin(x+y) - 2\sin x + \sin(x-y)}{\cos(x+y) - 2\cos x + \cos(x-y)} = \tan x$  [2]
- v) In an examination, a candidate is required to answer 6 out of 10 questions which are divided into two groups, each containing 5 questions, and he is not permitted to attempt more than 4 questions from each group. In how many ways can he make up his choice? [2]
- vi) If two sides of a square are:  $10x-4y-7=0$  and  $4x+10y-7=0$  and one vertex is origin find its area [2]
- vii) Find the equation of the line at a distance of 3 units from the origin and its perpendicular makes an angle A given  $\tan A = 5/12$ , with positive direction of x axis [2]
- viii) Prove that,  $\cos 10^\circ + \cos 110^\circ + \cos 130^\circ = 0$  [2]
- ix) Find the domain and range of the function  $f(x) = \frac{1}{\sqrt{9-x^2}}$  [2]
- x) If sin A and cos A are the roots of the equation  $px^2 + qx + r = 0$  then prove that  $p^2 - q^2 + 2pr = 0$  [2]

2 The sum of the third and the seventh terms of an AP is 6 and their product is 8. Find the sum of first sixteen terms of the A P [4]

3 Find the number of combinations and permutations of 4 letters taken from the word EXAMINATION [4]

4 A round table conference is to be held between 20 delegates. How many seating arrangements can be made if three particular delegates are i) always sit together ii) never sit together ? [4]

5 If  $\tan \frac{x}{2} = \frac{m}{n}$  Prove that  $m \sin x + n \cos x = n$  [4]

6 For any sets A and B, prove that  
 i)  $(A \cap B) \cup (A - B) = A$  ii)  $(A \cup B) - B = A - B$  [4]

Or

In a town of 10000 families, it was found that 40% families buy news paper A, 20% buy news paper B and 10% buy newspaper C, 5% families buy A and B, 3% buy B and C 4% buy A and C. If 2% buy all the three news paper, find the number of families which buy (i) A only (ii) none of A B and C

7 Find the sum of the series,  $4+11+22+37+56+\dots$  [4]

8 Which of the following are functions, ? Give reasons. If it is a function, determine the type of the function. (i)  $\{(1,2) (1,3) (2,5)\}$ , (ii)  $\{(1,2) (2,2) (3,5) (4,6)\}$  (iii)  $\{(1,2) (2,3) (3,4) (4,5)\}$  [4]

9 Prove that the line  $4x+y-5=0$  is a tangent to the circle  $x^2 + y^2 + 2x - y - 3 = 0$  also find the point of contact [4]

10 Show that  $\log_e 3 + \log_{e^2} 3 + \log_{e^3} 3 + \dots \dots \dots \infty = \log_e 9$

11 Find the equation of the circle touches the line  $2x-3y-7=0$  at  $(2, -1)$  and passes through  $(4,1)$  [4]

Or

A circle of radius 2 units lies in the first quadrant and touches both the coordinate axes. Find the equation of the circle with witch centre C  $(6, 5)$  and touching the above circle internally.

[6]

12 A Committee of 6 is chosen from 10 men and 7 women so as to contain at least 3 men and 2 women. In how many different ways can this be done if 2 particular men refuse to serve on the same committee? [6]

13 Find the value of  $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8}$  [6]

Find the mean and standard deviation for the following data.

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Class	11-14	15-18	19-22	23-26	27-30	31-33	34-37
Freq.	10	20	30	18	15	13	7

(use step deviation method.) [6]

Or

Find the mean deviation about the median for the data given below

Class	11-15	15-19	19-23	23-27	27-31	31-34	34-37
Freq.	15	25	33	16	14	13	9

### Section B

(Only for XI A and B students)

- 15 Find the equation of the ellipse whose axes are parallel to the coordinate axes having its centre at the point  $(-3,2)$ , one focus at  $(-3,3)$  and one vertex at  $(-3, 4)$ . Find the equation of the transverse axis [4]
- 16 Find the equation of the parabola passing through the points  $(2,1)$   $(1,2)$  and  $(3,5)$  and axis parallel to the x axis [4]
- 17 Find the equation of the parabola whose focus and vertex are respectively  $(6,3)$  and  $(3,6)$  respectively [6]
- 18 Show that  $3x^2 + 4y^2 - 12x - 8y + 4 = 0$  represents an ellipse. Find its centre, and foci. [6]

### Section C

(Only for XI D and E students)

- 19 Find the index number for the following data using weighted aggregate method.

Commodity	Current Year Average Price (Rs.)	Base Year Average Price (Rs)	Weights
A	45	40	30
B	50	48	40
C	18	20	15
D	10	12	10
E	100	95	5

[4]

The price relative (in per cent) and weight of three commodities are given below:

Commodities	A	B	C
Price relative	115	125	120

[4]

Weight	$w_1$	$w_2$	$w_1+w_2$
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If the sum of the weights is 20 and price index number of three commodities is 119%, find the numerical values of weights.

- 21 Production of special V.I.P. cars by a private company in Australia is as follows:

[6]

Year \ Quarters	Quarters			
	1	2	3	4
1989	26	36	24	11
1990	29	36	36	22
1991	40	52	43	17

Calculate the four quarterly moving averages and then draw the graphs of the given series and the moving averages. Briefly comment on the general trend.

[6]

- 22 The following table gives the number of failures of commercial industries in a country during the years 1975 to 1990. find five years moving averages and plot the **original** figures and moving averages in the same graph

Year	1975	1976	1977	1978	1979	1980	1981	1982
Number of failures	23	26	28	32	20	12	12	10
Year	1983	1984	1985	1986	1987	1988	1989	1990
Number of failures	19	13	15	14	12	10	4	2