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**O. P. JINDAL SCHOOL, SAVITRI NAGAR**  
**Half yearly Examination (2018 – 2019)**

Class: **11**  
Subject: **Mathematics**

MM: 100  
Time: 3 Hrs.

Name: \_\_\_\_\_

Class / Section: \_\_\_\_\_

Roll No.: \_\_\_\_\_

Fifteen Minutes Extra will be for reading the Question Paper.

General Instruction:

(i) All questions are compulsory.

(ii) The question paper consists of 30 questions divided into four sections A, B, C and D.

(iii) Section A contains 4 questions of 1 mark each, Section B contains 8 questions of 2 marks each, Section C contains 11 questions of 4 marks each and Section D contains 6 questions of 6 marks each.

**Section A**

- 1.) Find the number of subsets of the set  $A = \{1, 4, 5\}$ .
- 2.) If  $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$ . Find A and B.
- 3.) What is the value of  $\sin \frac{31\pi}{3}$ .
- 4.) Solve the inequality,  $3x - 5 < x + 7$ , when  $x$  is an integer.

**Section B**

- 5.) Let  $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $A = \{1, 2, 3, 4\}$ ,  $B = \{2, 4, 6, 8\}$  and  $C = \{3, 4, 5, 6\}$ .  
find (i)  $A'$  (ii)  $(A \cap C)'$  (iii)  $(A')'$  (iv)  $(B - C)'$ .
- 6.) If  $A = \{-1, 1\}$ , find  $A \times A \times A$ .
- 7.) A wheel makes 270 revolutions in one minute. Through how many radians does it turn in one second?
- 8.) Prove the following:  $\frac{\sin A + \sin 3A}{\cos A + \cos 3A} = \tan 2A$ .
- 9.) Find the multiplicative inverse of  $(4 - 3i)$ .
- 10.) Draw the graphical solution of the following system of inequation  $\frac{4-3x}{5} < \frac{2x-5}{4}$ .
- 11.) In a class of 25 boys and 15 girls, the teacher wants to select one boy and one girl. In how many ways this can be done?
- 12.) Find  $n$ , if:  ${}^{16}P_3 = 13^{n+1} P_3$ .

### Section C

- 13.) Let A, B and C be three sets such that  $A \cup B = A \cup C$  and  $A \cap B = A \cap C$ . Show that  $B = C$ .
- 14.) A survey was conducted of the TV programmes watched by 120 students of a school hostel. It was revealed that 70 students watched 'Discovery Channel' and 56 students watched "Sports Channel" whereas 24 watched both the programmes. Find the number of students who did not watch TV on that day.
- 15.) Find the domain and range of the real function  $f(x) = \sqrt{9-x^2}$ .
- 16.) If  $f = \left\{ \left( x, \frac{x^2}{1+x^2} \right) : x \in \mathbb{R} \right\}$  be a function from  $\mathbb{R}$  into  $\mathbb{R}$ . Determine the range of  $f$ .
- 17.) Prove that  $\sqrt{2+\sqrt{2+2\cos 4x}} = 2\cos x, 0 < x < \frac{\pi}{4}$ .
- 18.) Prove that  $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$ .
- 19.) By using "Principle of Mathematical Induction", prove that for,  $1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}, n \in \mathbb{N}$ .
- 20.) Find the square roots of  $3 + 4i$ .
- 21.) Express,  $\frac{5 + \sqrt{2}i}{1 - \sqrt{2}i}$  in the form  $a + ib$ .
- 22.) I.Q. of a person is given by formula  $I.Q. = \frac{M.A.}{C.A.} \times 100$ , where M.A. stands for mental age and C.A., stands for chronological age. If  $75 \leq I.Q. \leq 135$  for a group of 9 year children. Find the range of their mental age.
- 23.) 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.

### Section D

- 24.) In how many ways can the letters of the word, "ASSASSINATION" be arranged so that all the S's are together?
- 25.) By using "Principle of Mathematical Induction", prove that  $3^{2n+2} - 8n - 9$  is divisible by 8.
- 26.) Solve the following system graphically:-  
 $3x - y \leq 10, x + y \leq 6, x - y \leq 2, x \geq 0$  and  $y \geq 0$ .
- 27.) A committee of 5 is to be formed out of 6 men and 4 women. In how many ways can this be done if  
 (i) at least 2 women are included,  
 (ii) atmost 2 women are included?
- 28.) Prove that,  $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$ .
- 29.) If  $\alpha$  and  $\beta$  are different complex numbers with  $|\beta| = 1$ , then find  $\left| \frac{\beta - \alpha}{1 - \bar{\alpha}\beta} \right|$ .

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25/9/18