



**B.Sc. VI Semester (CBCS) Degree Examination, May/June-2019**

**MATHEMATICS**

**Trigonometry Topology and Fuzzy Sets**

**Paper No. - 6.1**

**Time : 3 Hours**

**Maximum Marks : 70**

**Instructions to Candidates:**

Answer all Sections.

**SECTION - A**

Answer any **Five** of the following.

**(5×2=10)**

1. Define Interior point, exterior point of a set.
2. Let  $(X, \tau)$  be a topological space Let  $x \in X$ ,  $N_1$  &  $N_2$  be two neighbourhoods of  $x$  then prove that  $N_1 \cap N_2$  is also a neighbourhood of  $x$ .
3. Give an example to show that  $\overline{A \cap B} \neq \overline{A} \cap \overline{B}$ .
4. Prove that  $\cosh(x-y) = \cosh x \cdot \cosh y - \sinh x \cdot \sinh y$ .
5. If  $\sin(A+iB) = x+iy$ . Prove that  $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$ .
6. Define compliment of a fuzzy subset with an example.
7. Let  $Y = \{y_1, y_2, y_3, y_4\}$ . Let  $A = \{(y_1, 0.1), (y_2, 0.8), (y_3, 0), (y_4, 1)\}$   
 $B = \{(y_1, 0.5), (y_2, 0.7), (y_3, 0.2), (y_4, 1)\}$ . Then find  $A \vee B, A \wedge B$ .

[P.T.O]



**SECTION - B**

Answer any FIVE of the following.

(5×6=30)

8. Let  $R$  be the set of all real numbers and  $\mathcal{u}$  be the family of subsets of  $R$  defined as follows i)  $A = \emptyset$  or ii) if  $A$  is non empty then for every  $x \in A \exists$  an open interval  $I$  such that  $x \in I \subset A$  then prove that  $\mathcal{u}$  is a topology on  $R$ .
9. Let  $(X, \tau)$  be a topological space then a subset  $A$  of  $X$  is open if and only if  $A$  is a neighbourhood of each of its points.
10. Let  $(X, \tau)$  be a topological space.  $A, B$  be subsets of  $X$  then prove that  
i)  $d(\emptyset) = \emptyset$  ii) If  $A \subset B$  then  $d(A) \subset d(B)$ .
11. Let  $(X, \tau)$  be a topological space. Let  $A, B$  be subsets of  $X$  then prove that  
i. If  $A \subset B$  then  $\overline{A} \subset \overline{B}$ .  
ii.  $\overline{A \cup B} = \overline{A} \cup \overline{B}$   
iii.  $\overline{A \cap B} \subset \overline{A} \cap \overline{B}$ .
12. Let  $X = \{a, b, c, d, e\}$ ,  $\tau = \{\emptyset, X, \{a\}, \{a, b\}, \{a, b, c\}, \{a, b, c, d\}\}$  be a topology on  $X$ . Find  $A^\circ, (A')^\circ, \partial(A)$  where  $A = \{a, c, d\}$ .
13. Let  $(X, \tau)$  be a topological space and  $A$  be a subset of  $X$  which is neither empty nor a singleton set. Find  $d(A)$ .
14. Prove that every finite  $T_1$  space is discrete.

SECTION - C

Answer any Five of the following.

(5×6=30)

15. Expand  $\sin^7 \theta$  in ascending powers of  $\sin \theta$ .

16. Prove that  $2^{\frac{n}{2}} \cos\left(\frac{n\pi}{4}\right) = 1 - nC_2 + nC_4 - nC_6 + \dots$  where  $n$  is a +ve integer.

17. Show that  $16 \sin^5 \theta = \sin 5\theta - 5 \sin 3\theta + 10 \sin \theta$ .

18. Find all the values of  $\log \left[ \frac{1 + \cos \alpha + i \sin \alpha}{1 + \cos \alpha - i \sin \alpha} \right]$ .

19. Sum the series  $1 + \frac{\cos \theta}{1!} + \frac{\cos 2\theta}{2!} + \frac{\cos 3\theta}{3!} + \dots \infty$ .

20. Let  $A, B$  be any two fuzzy subsets of  $X$ . Let  $\alpha, \beta \in [0, 1]$  then prove that

i)  $\alpha_{A \wedge B} = \alpha_A \cap \alpha_B$ .

ii)  $\alpha_{A \vee B} = \alpha_A \cup \alpha_B$ .

21. Let  $f: X \rightarrow Y$  be a function where  $X, Y$  are two sets. Prove that  $f(A \vee B) = f(A) \vee f(B)$ .