

**PABSON, Kathmandu**  
**MID TERM EXAM-2080**

Subject: Opt. I Mathematics  
Class: 10

Full Marks: 100  
Time: 3 hours.

*Candidates are required to write their answers according to the instructions given.*

Attempt all questions.

**Group A**  
**[5x(1+1)=10]**

1. a) What type of function have inverse?  
b) For what value of  $x$ , the function  $f(x) = \frac{2x-1}{2x-3}$  is discontinuous?
2. a) If  $a, 10, 25$  are in G.P, find the value of  $a$ .  
b)  $PQ=QP=I$ , what is the relation between matrices  $P$  and  $Q$ ?
3. a) What is the general equation of a circle?  
b) The slopes of two lines are  $m_1$  and  $-\sqrt{3}$ . If the lines are parallel, what will be the value of  $m_1$ .
4. a) Write  $2\cos^2 A$  in terms of  $\cos 2A$ .  
b) Write  $\cos C - \cos D$  in terms of product.
5. a) What is the single equation to represent the pair of lines  $m-3=0$  and  $m+3=0$ ?  
b) Write a merit of standard deviation.

**Group 'B'**  
**[3(2+2+2) + 2(2+2)=26]**

6. a) State factor theorem. Use it to show that  $x - 1$  is a factor of  $x^3 - 13x - 12$ .  
b) If  $g(x) = 2x + 1$  and  $h(x) = x - 1$ , find the values of  $goh(x)$  and  $goh(-2)$ .  
c) At what two points does the curve  $f(x) = x^2 - 4$  cuts  $x$ -axis?
7. a) If  $A = \begin{bmatrix} -2 & 8 \\ 3 & -4a \end{bmatrix}$  and  $|A| = 16$ , what will be the value of  $a$ ?

- b) If  $P+Q+R=180^\circ$  and  $\cos P = \cos Q \cos R$ , prove that:  
 $\tan P = \tan Q + \tan R$ .
8. a) Find the obtuse angle between the lines  $2x - y + 4 = 0$  and  $x - y = -5$ .
- b) If the lines  $ax + by + c = 0$  and  $px + qy + r = 0$  are parallel to each other, prove that  $aq = bp$ .
9. a) If  $\sin \alpha = \frac{1}{2} \left( a + \frac{1}{a} \right)$  then prove that:  $\cos 2\theta + \frac{1}{2} \left( a^2 + \frac{1}{a^2} \right) = 0$
- b) Prove that:  $\frac{\sin \frac{\theta}{2} - \sqrt{1 + \sin \theta}}{\cos \frac{\theta}{2} - \sqrt{1 + \sin \theta}} = \cot \frac{\theta}{2}$ .
- c) Solve:  $\cos 2A - \sin A = 0$  ( $0 \leq A \leq 90^\circ$ )
10. a) Find the co-ordinates of the centre of a circle having equations of two diameters  $x+y=5$ . <https://www.nebstudy.com>
- b) Show that:  $\frac{\cos 10^\circ + \cos 80^\circ}{\cos 80^\circ - \sin 10^\circ} = \tan 55^\circ$ .
- c) In a data, the first quartile is 15 and the coefficient of the quartile deviation is 0.25. Find the third quartile and the quartile deviation.

**Group 'C'**  
**[11x4=44]**

11. Solve:  $3x^3 - 7x^2 + 4 = 0$
12. If A.M and G.M of two numbers is 50 and 40 respectively, find the numbers.
13. Find the maximum value of  $Z = 4x + 5y + 8$  under the constraints:  $x + y \leq 7, x - y \geq -1, x \geq 0, y \geq 0$
14. Solve by matrix method:  $2x - 3y = 7, 3x - 4y - 10 = 0$
15. If the line  $\frac{x}{a} + \frac{y}{b} = 1$  passes through the point of intersection of the lines  $x+y=3$  and  $2x - 3y = 1$  and is parallel to the line  $y = x - 6$ , the find the value of a and b.
16. Prove that:  $\frac{\sec 4\theta - 1}{\sec 2\theta - 1} = \tan 4\theta \cdot \cot \theta$

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17. If  $A + B + C = \pi$ , prove that:

$$\sin^2 \frac{A}{2} + \sin^2 \frac{B}{2} + \sin^2 \frac{C}{2} = 1 - 2 \sin \frac{A}{2} \cdot \sin \frac{B}{2} \cdot \sin \frac{C}{2}$$

18. Prove that:  $\tan 0 + 2 \tan 20 + 4 \cot 40 = \cot 0$

19. Solve:  $\tan^2 y - (1 + \sqrt{3}) \tan y + \sqrt{3} = 0$   $[0^\circ \leq y \leq 360^\circ]$

20. Calculate the mean deviation from median.

Marks Obtained	0-10	10-20	20-30	30-40	40-50
No. of Students	2	3	6	5	4

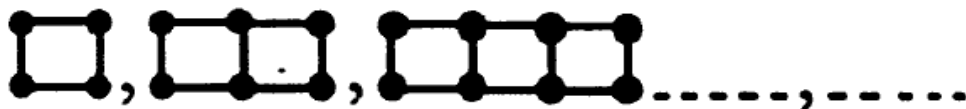
21. From the following data, find the variance and the coefficient of variation.

Marks Obtained	0-10	0-20	0-30	0-40	0-50
No. of Students	1	5	12	15	20

**Group 'D'**  
**[4x5=20]**

22. Define polynomial. Prove that the polynomial  $p(x) = x(x-1)(x-2)(x-3) - 120$  has a factor  $(x-5)$

23. From the given patterns of numbers, find the  $n^{\text{th}}$  term and  $10^{\text{th}}$  term.



24. Solve (by using graph):  $x^2 + 2x - 3 = 0$ .

25. Find the equation of a circle passing through the point  $(4,3)$  and concentric with the circle having equation  $x^2 + y^2 + 6x - 8y - 11 = 0$ .



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