Board of Intermediate Education (TS)

Junior Inter Mathematics - IA (2021)

Model Paper (English Version)

Time: 3 Hrs. **Maximum Marks: 75**

Note: This question paper consists of three sections A, B and C

SECTION - A

I. Very short answer type questions.

i) Answer All the questions.

ii) Each question carries Two marks. **10 × 2 = 20**

1. If $A = \left\{0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}\right\}$ and $f : A \to B$ is a surjection defined by $f(x) = \cos x$ then find B.

2. Find the domain of the real valued function $f(x) = \frac{\sqrt{2+x} + \sqrt{2-x}}{x}$.

3. Find the trace of A if $A = \begin{bmatrix} 1 & 2 & -\frac{1}{2} \\ 0 & -1 & 2 \\ -\frac{1}{2} & 2 & 1 \end{bmatrix}$

4. Define symmetric matirx if $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix then find x.

5. $a = 2i + 5j + k$ and $b = 4i + mj + nk$ are collinear vectors then find m and n.

6. OABC is a parallelogram if $\overline{OA} = \bar{a}$ and $\overline{OC} = \bar{c}$ find the vector equation of the side BC.

7. If the vectors $2i + \lambda j - k$ and $4i - 2j + 2k$ are $\perp$ to each other find λ.

8. $\cos\theta + \sin\theta = \sqrt{2}\sin\theta$ then prove that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$

9. Prove that $\frac{\cos 9° + \sin 9°}{\cos 9° - \sin 9°} = \cot 36°$

10. If $\cos h(x) = \frac{5}{2}$, find the values of $\cos h(2x)$ and $\sin h(2x)$.

SECTION - B

II. Short answer type questions.

i) Answer any Five questions.

ii) Each question carries Four marks. **5 × 4 = 20**

11. If $\theta - \phi = \frac{\pi}{2}$ then show that

$$\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix} \begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix} = 0$$

12. a, b, c non–coplanar vectors prove that the following four points are coplanar $6a + 2b - c$, $2a - b + 3c$, $-a + 2b - 4c$, $-12a - b - 3c$.

13. Let $\bar{a}$ and $\bar{b}$ be vectors satisfying $|a| = |b| = 5$ and $(a, b) = 45°$. Find the area of the triangle having $\bar{a} - 2\bar{b}$ and $3\bar{a} + 2\bar{b}$ and as two its sides.

14. $\left(1 + \cos\frac{\pi}{10}\right)\left(1 + \cos\frac{3\pi}{10}\right)\left(1 + \cos\frac{7\pi}{10}\right)\left(1 + \cos\frac{9\pi}{10}\right) = \frac{1}{16}$

15. If $0 < A, B < \frac{\pi}{4}$ and $\sin(A + B) = \frac{24}{25}$ and $\cos(A - B) = \frac{4}{5}$ then find the value of $\tan 2A$.

16. Show that $a\cos^2\frac{A}{2} + b\cos^2\frac{B}{2} + c\cos^2\frac{C}{2} = s + \frac{\Delta}{R}$

17. If $a : b : c = 7 : 8 : 9$ find $\cos A : \cos B : \cos C$.

18. $A = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -3 & 0 \\ 5 & 4 \end{bmatrix}$ then verify that $(AB)' = B'A'$.

19. Prove that $\frac{\cos hx}{1 - \tan hx} + \frac{\sin hx}{1 - \cot hx} = \sin hx + \cos hx$, for $x \neq 0$.

20. If the vectors $a = 2i - j + k$, $b = i + 2j - 3k$ and $c = 3i + pj + 5k$ are coplanar then find p.

SECTION - C

III. Long Answer type questions.

i) Answer any Five questions.

ii) Each question carries Seven marks. **$5 \times 7 = 35$**

21. If the function 'f' is defined by

$$f(x) = \begin{cases} 3x - 2 & x > 3 \\ x^2 - 2 & -2 \le x \le 2 \\ 2x + 1 & x < -3 \end{cases}$$ then find the value of i) f(4), ii) f(2.5), iii) f(–2), iv) f(–4), v) f(0), vi) f(–7)

22. Solve $3x + 4y + 5z = 18$, $2x - y + 8z = 13$ and $5x - 2y + 7z = 20$ by using matrix inversion method.

23. Solve the following system of equations by using Cramer's rule $x - y + 3z = 5$, $4x - 2y - z = 0$, $-x + 3y + z = 5$

24. i) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then show that $A^2 - 4A - 5I = 0$

ii) If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ show that $A.A' = A'.A = I$

25. $a = 3i - j + 2k$, $b = -i + 3j + 2k$, $c = 4i + 5j - 2k$ and $d = i + 3j + 5k$ then compute the following

i) $(a \times b) \times (c \times d)$

ii) $(a \times b).c - (a \times d).b$

26. If A, B, C are angles of triangle prove that $\cos 2A + \cos 2B + \cos 2C = -4\cos A \cos B \cos C - 1$

27. In a ΔABC if $r_1 = 8$, $r_2 = 12$, $r_3 = 24$ find a, b, c.

28. Find the vector equation of the plane passing through points $4i - 3j - k$, $3i + 7j - 10k$ and $2i + 5j - 7k$ and show that the point $i + 2j - 3k$ lies in the plane.

29. If [b c d] + [c a d] + [a b d] = [a b c] then show that the points with position vectors a, b, c, d are coplanar.

30. If $\cot\frac{A}{2} : \cot\frac{B}{2} : \cot\frac{C}{2} = 3 : 5 : 7$ show that a : b : c = 6 : 5 : 4.

Please click for Answers

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