BOARD OF INTERMEDIATE EDUCATION A.P.: HYDERABAD
MODEL QUESTION PAPER w.e.f. 2012-13
MATHEMATICS - IA

(English Version)

Time: 3 hours **Max. Marks: 75**

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

SECTION - A **10 x 2 = 20 Marks**

I. Very Short Answer Questions:
(i) Answer <u>All</u> Questions
(ii) Each Question carries <u>Two</u> marks.

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 $\frac{1}{\log(2-x)}$.

3. A certain bookshop has 10 dozen chemistry books, 8 dozen physics books, 10 dozen economics books. Their selling prices are Rs. 80, Rs. 60 and Rs. 40 each respectively. Find the total amount the bookshop will receive by selling all the books, using matrix algebra.

4. If $A=\begin{bmatrix}2 & -4\\ -5 & 3\end{bmatrix}$, then find $A+A'$ and AA'.

5. Show that the points whose position vectors are $-2\bar{a}+3\bar{b}+5\bar{c}$, $\bar{a}+2\bar{b}+3\bar{c}$, $7\bar{a}-\bar{c}$ are collinear when $\bar{a},\bar{b},\bar{c}$ are non-coplanar vectors.

6. Let $\bar{a}=2\bar{i}+4\bar{j}-5\bar{k}$, $\bar{b}=\bar{i}+\bar{j}+\bar{k}$ and $\bar{c}=\bar{j}+2\bar{k}$. Find unit vector in the opposite direction of $\bar{a}+\bar{b}+\bar{c}$.

7. If $\bar{a}=\bar{i}+2\bar{j}-3\bar{k}$ and $\bar{b}=3\bar{i}-2\bar{j}+2\bar{k}$ then show that $\bar{a}+\bar{b}$ and $\bar{a}-\bar{b}$ are perpendicular to each other.

8. Prove that $\frac{\cos9^0+\sin9^0}{\cos9^0-\sin9^0}=\cot36^0$.

9. Find the period of the function defined by $f(x)=\tan(x+4x+9x+....+n^2x)$.

10. If $\sinh x=3$ then show that $x=\log_e(3+\sqrt{10})$.

SECTION - B 5 x 4 = 20 Marks

II. Short Answer Questions.

(i) Answer any Five questions.

(ii) Each Question carries Four marks.

11. Show that $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$.

12. Let A B C D E F be regular hexagon with centre 'O', show that

$\overline{AB} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{AF} = 3\overline{AD} = 6\overline{AO}$.

13. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}$, $\bar{b} = 2\bar{i} + \bar{j} - \bar{k}$ and $\bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ find $\bar{a} \times (\bar{b} \times \bar{c})$.

14. If A is not an integral multiple of $\frac{\pi}{2}$, prove that

(i) $\tan A + \cot A = 2 \operatorname{cosec} 2A$

(ii) $\cot A - \tan A = 2 \cot 2A$

15. Solve: $2\cos^2\theta - \sqrt{3}\sin\theta + 1 = 0$.

16. Prove that $\cos\left(2\tan^{-1}\frac{1}{7}\right) = \sin\left(4\tan^{-1}\frac{1}{3}\right)$.

17. In a ΔABC prove that $\tan\left(\frac{B-C}{2}\right) = \frac{b-c}{b+c}\cot\frac{A}{2}$.

SECTION - C 5 x 7 = 35 Marks

III. Long Answer Questions.

(i) Answer any Five questions.

(ii) Each Question carries Seven marks.

18. Let $f : A \to B$, $g : B \to C$ be bijections. Then prove that $(gof)^{-1} = f^{-1}og^{-1}$.

19. By using mathematical induction show that $\forall n \in N$,

$\frac{1}{1.4} + \frac{1}{4.7} + \frac{1}{7.10} + \ldots\ldots \text{upto} \quad n \quad \text{terms} = \frac{n}{3n+1}$.

20. If $A=\begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$ then find $(A')^{-1}$.

21. Solve the following equations by Gauss - Jordan method

$3x+4y+5z=18$, $2x-y+8z=13$ and $5x-2y+7z=20$.

22. If A = (1, –2, –1), B = (4, 0, –3), C = (1, 2, –1) and D = (2, –4, –5), find the distance between $\overline{AB}$ and $\overline{CD}$.

23. If A, B, C are angles of a triangle, then prove that

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

24. In a ΔABC, if a = 13, b = 14, c = 15, find R, r, r_1, r_2 and r_3.

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