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B. Pharmacy 1st Semester Examination

Mathematics-I (O.S.)

HBP-103

Time : 3 Hours **Max. Marks : 80**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five question in all, selecting one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Solve $\sqrt{x+5}+\sqrt{x+15}=\sqrt{6x+40}$

   (b) Solve by Cramer's Rule the following system of linear equations

   $x+2z=7;\ x+y+z=6$ and $3x+y+z=12$

   (c) Find x, y if

   $$3\begin{bmatrix}4 & 2\\ 1 & 3\end{bmatrix}-2\begin{bmatrix}-2 & 1\\ 3 & 2\end{bmatrix}+\begin{bmatrix}x & -4\\ 3 & y\end{bmatrix}=0$$ **(6+5+5=16)**

2. (a) Find the adjoint of the matrix

   $$A=\begin{bmatrix}1 & -1 & 2\\ 3 & 0 & -2\\ 1 & 0 & 3\end{bmatrix}$$

   (b) Find mean, mode and median of the data

   5, 19, 20, 6, 19, 20, 9, 19, 19, 10, 15

(c) Using properties of the determinants prove that

$$\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = 0$$ **(6+5+5=16)**

SECTION - B

3. (a) Prove that

$$\frac{\sin x + \sin y}{\cos x + \cos y} = \tan\left(\frac{x+y}{2}\right)$$

(b) Prove that

$$\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$$

(c) Prove that

$$\frac{\cos(\pi+\theta)\cos(-\theta)}{\sin(\pi-\theta)\cos\left(\frac{\pi}{2}+\theta\right)} = \cot^2\theta$$ **(5+6+5=16)**

4. (a) Evaluate cos (75°)

(b) Prove that

$$\sin 105^\circ + \cos 105^\circ = \frac{1}{\sqrt{2}}$$

(c) Express as a sum or difference

$$\cos\left(\frac{\pi}{4}+20\right)\cos\left(\frac{\pi}{4}-\theta\right)$$ **(5+6+5=16)**

SECTION - C

5. (a) Find point on x-axis which is equidistant from (3, 2) and (–5, –2).

(b) Find the value of x so that the points (3, –2); (x, 2) and (8, 8) may be collinear.

(c) Find the locus of all points equidistant from the points (6, 1) and (0, 4). **(5+6+5=16)**

6. (a) Find the equation of the line which makes equal intercepts on the axes as passes through the point (1, 2).

(b) Find the equations of the sides of the triangle whose vertices are

(0, 5); (–1, –2); and (3, 5)

(c) The vertices of the triangle are A(3, 4); B(–1, 2) and C(5, –4). Find the equation of the median through the vertex A.
(5+6+5=16)

SECTION - D

7. (a) Evaluate : $\lim_{x \to 3} \frac{x^3 - 27}{x^2 - 9}$

(b) Differentiate the following w.r.t. x

(i) $\frac{\sin^2 x}{1 + \cos^2 x}$ (ii) $x \cot^3 x$

(c) Find $\frac{dy}{dx}$, if $y = \sin x^{\cos x}$ **(5+6+5=16)**

8. (a) Find $\int \sin^{-1} x \, dx$

(b) Evaluate $\int \frac{dx}{(x^2 - 4)(x + 3)}$

(c) Evaluate $\int x^3 . \log x \, dx$ **(5+6+5=16)**

[P.T.O.]

SECTION - E

9. (a) Solve $x^3 - x = 0$

(b) Define skew symmetric matrix alongwith one example.

(c) Find mean of Ist ten natural numbers.

(d) Find $\frac{d}{dx}\left(e^{\log x}\right)$

(e) Find slope of the straight line

$\sqrt{6}x + \sqrt{3}y + 9 = 0$

(f) Evaluate $\int \frac{\sin x}{1+\cos x}\, dx$

(g) Evaluate $\underset{x\to 0}{Lt} \frac{\tan 5x}{4x}$

(h) Prove that $\cos^2(\pi - \theta) + \cos^2\left(\frac{\pi}{2} + \theta\right) = 1$ **(2×8=16)**