First Year Pharm. D. Examination

REMEDIAL MATHEMATICS

(USC – 35113)

P. Pages : 3

Time : Three Hours] [Max. Marks : 70

Note : (1) Answer any **Five** questions from Q. **Two** to Q. **Nine**.
(2) Question no **One** is compulsory.
(3) Illustrate your answer wherever necessary with the help of neat sketches.
(4) Use pen of Blue/Black ink/refill only for writing the answer book.

1. Attempt any **Five** of the following :—

(a) If $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix}$

Show that $AB = BA = I$

(b) Find the value of $\sin^2 60^0 + \tan^2 45^0 - \operatorname{cosec}^2 30^0$

(c) Evaluate :

$$\lim_{x \to 0} \left\{ \frac{\sqrt{1+x} - 1}{x} \right\}$$

(d) Find $\frac{dy}{dx}$, if $y = e^{4x} \sin 6x$

(e) Find order and degree of differential eq^n.

$$\left(\frac{d^3y}{dx^3}\right)^{1/2} = \left[1 + \frac{dy}{dx} + \left(\frac{dy}{dx}\right)^2\right]^{2/3}$$

(f) Evaluate :

$$\int \frac{2 + 3\cos x}{\sin^2 x} \, dx$$

(g) Find x if $\begin{vmatrix} 0 & 7 & -2 \\ 11 & x & 10 \\ 4 & 8 & 1 \end{vmatrix} = 0$

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2. (a) Find A^{-1} by Adjoint method

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$$ 4

(b) Solve by using determinant (Cramer's Rule)

$x + y + z = 1,\ 2x + 3y + z - 4 = 0$

$4x + z + 4y = 16$ 4

(c) Show that the matrix

$$A = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$$

is an orthogonal matrix 3

3. (a) Prove that $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \operatorname{cosec}\theta - \cot\theta$ 3

(b) In any $\triangle ABC$ (triangle ABC), Prove that $\tan A + \tan B + \tan C = \tan A \tan B \tan C$ 4

(c) Prove that. $\frac{\cos 3\theta}{\cos\theta} + \frac{\sin 3\theta}{\sin\theta} = 4\cos 2\theta$ 4

4. (a) Evaluate $\lim_{x \to 0} \frac{(1+x)^n - 1}{x}$ 3

(b) If $y = (\sin x)^{\log x}$, then find $\frac{dy}{dx}$. 4

(c) Find $\frac{dy}{dx}$, if $y = \frac{x+1}{x-1}$ 4

5. Find the Laplace Transform of the following :

(a) $\cosh at - \cos at$ 3

(b) $6e^{2t} + 5e^{-3t} - 2\cos t + 7t^3 + 2$ 4

(c) $\sin^3 3t$ 4

6. (a) If $z = 3x^2 + 2y^2 + 4xy$ then find $\frac{\partial^2 z}{\partial x^2}$ and $\frac{\partial^2 z}{\partial y^2}$ 5

(b) If $v = (x^2 + y^2 + z^2)^{-1/2}$ prove that

$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} = 0$$ 6

7. Evaluate the following

(a) $\int_0^1 \frac{e^x - e^{-x}}{e^x + e^{-x}}\, dx$ 3

(b) $\int_0^{\pi/2} \frac{\cos x}{\sin x + \cos x}\, dx$ 4

(c) $\int_0^3 \frac{dx}{\sqrt{3x - x^2}}$ 4

8. (a) The length of the tangent segment from the point (–2, 3) to the circle $2x^2 + 2y^2 = a^2$ is $\sqrt{5}$ units. Then find the radius of the circle. 5

(b) A straight line, drawn through the point A(2, 1) makes an angle $\frac{\pi}{4}$ with the +ve direction of x-axis and intersects another line $x + 2y + 1 = 0$ at a pt. B. Find the length of AB. 4

(c) Find the angle made by the line $x + \sqrt{3}y - 6 = 0$ with the +ve direction of x - axis. 2

9. (a) Solve $(x^2 - yx^2)\, dy + (y^2 + xy^2)\, dx = 0$ 4

(b) Solve $(2xy + y - \tan y)\, dx + (x^2 - x\tan^2 y + \sec^2 y)\, dy = 0$ 4

(c) Solve $\frac{dy}{dx} = (4x + y + 1)^2$ 3