

# Second Half 2019 Y. B. Pharm (sem-III) Maths & Stats.

**QP Code :13733**

Duration: 3 Hrs

Maximum marks: 70

Note: All Questions are compulsory

Use of simple calculator is allowed

Figure at right indicate maximum marks

Q1.	(a)	Attempt any 7 [ 2 marks each]:	[14]
	(i)	If $A = \begin{bmatrix} 2 & 2 \\ -5 & -7 \end{bmatrix}$ then the inverse of A is: (a) $\begin{bmatrix} -7 & -3 \\ 5 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} -2 & 3 \\ -5 & 7 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & -5 \\ 3 & -7 \end{bmatrix}$ (d) $\begin{bmatrix} 2 & 5 \\ -3 & -7 \end{bmatrix}$	
	(ii)	The value of $\int_0^1 (2x + 3x^2 + 4x^3 + 1) dx$ is: (a) 0 (b) 1 (c) 3 (d) 4	
	(iii)	If $A = \begin{bmatrix} k & k & 4 \\ 3 & 1 & 2 \\ 1 & 2 & 3 \end{bmatrix}$ is a singular matrix, then the value of k is: (a) 15/4 (b) 5/7 (c) 15/4 (d) 40/8	
	(iv)	The Rolle's theorem is defined on a function which should be : (a) Continuous on the closed interval [a,b] (b) Continuous on the open interval (a, b) (c) Derivable in the open interval (a, b) (d) both a and c	
	(v)	If $y = x^2$ , then $\Delta^2 y$ by taking $h = 1$ is: (a) -1 (b) 1 (c) 2 (d) -	
	(vi)	The $n^{\text{th}}$ derivative of $f(x) = \frac{1}{4x+9}$ is: (a) $Y_n = \frac{(-1)^{n+2}(n)4^n}{(4x+9)^{n+2}}$ (b) $Y_n = \frac{(-1)^n(n)4^n}{(4x+9)^{n+1}}$ (c) $Y_n = \frac{(-1)^n(n)4^n}{(4x+9)^n}$ (d) $Y_n = \frac{(-1)^n(n+1)4^n}{(4x+9)^{n+1}}$	
	(vii)	General solution for the differential equation $(D^2 - 5D + 6)y = 0$ is: (a) $c_1 e^{-3x} + c_2 e^{2x}$ (b) $c_1 e^{2x} + c_2 e^{3x}$ (c) $c_1 e^{-3x} + c_2 e^{-2x}$ (d) $c_1 e^{-x} + c_2 e^{-2x}$	
	(viii)	The rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ is: (a) 0 (b) 1 (c) 2 (d) 3	
	(ix)	For $f(x, y) = x^2 + xy + y^2$ , the value of $\frac{\partial^2 f}{\partial x^2}$ is: (a) $2x + y$ (b) 1 (c) 2 (d) $x + 2y$	
	(x)	Attempt any 1:	[1]
	(xi)	Which of the following is not a homogeneous differential equation? (a) $f(x, y) = 2x - 9y$ (b) $f(x, y) = 3x^2 - 7y^2$ (c) $f(x, y) = x^2 + 3y^2 - 1$ (d) a and b	
	(xii)	The value of $\int_{-2}^2 x^3 dx$ is: (a) 16/3 (b) 8/3 (c) 0 (d) 3/16	

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**[TURN OVER**

Q2.	(a)	Attempt any two ( 4 marks each)	[8]
	(i)	Find the $N^{\text{th}}$ derivative of $y = \sin^3 x$	
	(ii)	Using Taylor's series, expand $f(x) = \sin x$ in ascending powers of $(x - \pi/2)$	
	(iii)	If $u = y \cdot \sin(x, y)$ , then show that $y \frac{\partial u}{\partial y} - x \frac{\partial u}{\partial x} = u$	
	(b)	Attempt any one (3 marks)	[3]
	(i)	Verify Rolle's theorem for the function $f(x) = x^3 - x^2 - x + 1$ on $[-1, 1]$	
	(ii)	Differentiate the equation $(1 + x^2)y^2 - xy^2 + y = 0$ , 'n' times with respect to x.	
Q3.	(a)	Attempt any two ( 4 marks each)	[8]
	(i)	Obtain the reduction formula for $\int \sin^n x \, dx$	
	(ii)	The loop of the curve $y^2 = x(x-1)^2$ rotates about x-axis. Find the volume of the solid formed.	
	(iii)	Prove that $\int_0^{\pi/2} \log(\tan x) \, dx = 0$ .	
	(b)	Attempt any one (3 marks)	[3]
	(i)	Find the area bounded by the curve $y = \sin x$ and the x-axis and the line $x=0$ and $x = \pi$ .	
	(ii)	Using the properties of Definite Integral, show that $\int_{-\pi/2}^{\pi/2} \sin 3x \cdot \cos 5x \, dx = 0$	
Q4.	(a)	Attempt any two ( 4 marks each)	[8]
	(i)	By using the Adjoint method, find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$	
	(ii)	Evaluate $A = \begin{bmatrix} 265 & 240 & 219 \\ 240 & 225 & 198 \\ 219 & 198 & 181 \end{bmatrix}$ by using the determinant properties.	
	(iii)	Solve by Cramer's rule: $x + 2y + z = 12$ , $2x + y + z = 11$ , $x - y + 2z = 1$	

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	(b) Attempt any one (3 marks)	[3]
	Solve the equation $\begin{vmatrix} 1 & -6 & -x \\ 2 & -3 & x-3 \\ -3 & 2 & x+2 \end{vmatrix} = 0$	
	(ii) Find the Rank of the matrix $A = \begin{bmatrix} 1 & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 2 & -6 & 5 \end{bmatrix}$	
Q5	(a) Attempt any two (4 marks each)	[8]
	(i) Solve the differential equation $\sec^2 x \tan y dx + \sec^2 y \tan x dy = 0$	
	(ii) Find the particular solution of $(D^2 + D - 2)y = 0$ when $x = 0, y = 1$ and $\frac{dy}{dx} = 0$	
	(iii) Solve $(D^2 + 3D + 2)y = x - x^2$	
	(b) Attempt any one (3 marks)	[3]
	(i) Form the differential equation of $x^2 + y^2 = a^2$ , where $a$ is an arbitrary constant.	
	(ii) Solve the differential equation: $x \frac{dy}{dx} = y - x$	
Q6	(a) Attempt any two (4 marks each)	[8]
	(i) By using Lagrange's interpolation formula estimate $y$ when $x = 4$ from the following data	
	$\begin{array}{cccc} x & 0 & 2 & 5 & 6 \\ y & 7 & 11 & 17 & 19 \end{array}$	
	(ii) The value of a function $f(x)$ for certain values of $x$ are given below.	
	$\begin{array}{ c c c c c c } \hline x & 0 & 2 & 4 & 6 & 8 & 10 \\ \hline f(x) & -3 & 1 & 13 & 33 & 61 & 97 \\ \hline \end{array}$	
	Use Simpson's 1/3 rd Rule to find $\int_0^{10} f(x) dx$ .	
	(iii) Estimate the missing term by using $E$ and $\Delta$ from the following:	
	$\begin{array}{cccc} x & 0 & 1 & 2 & 3 & 4 \\ y & 1 & 3 & 9 & - & 81 \end{array}$	
	(b) Attempt any one (3 marks)	[3]
	(i) Evaluate $\left(\frac{\Delta^2}{E}\right) \sin x$ .	
	(ii) Given: $x : 1 \quad 2 \quad 4$ $f(x) : 2 \quad 6 \quad 24$ Estimate $f(3)$ by constructing the difference table and making a suitable assumption.	