

Day and Date:day, .../.../2022

Seat No :

Time: ----- to -----

Max. Marks- 50

OBJECTIVE

Unit 1		3 questions of 2 marks each	6 marks	20 marks	40%
Unit 2		3 questions of 2 marks each	6 marks		
Unit 3		4 questions of 2 marks each	8 marks		
Unit 4		5 questions of 2 marks each	10 marks	30 marks	60%
Unit 5		5 questions of 2 marks each	10 marks		
Unit 6		5 questions of 2 marks each	10 marks		

		Correct Option
Q. 1)	What is the C.F. of $(D^2 - 1)^2 y = 0$	B
	A) C.F. = $(C_1 + C_2 x + C_3 x^2 + C_4 x^3) e^{-x}$	
	B) C.F. = $(C_1 + C_2 x) e^x + (C_3 + C_4 x) e^{-x}$	
Q. 2)	C) C.F. = $e^{-x} (C_1 \cos x + C_2 \sin x)$	D
	D) C.F. = $C_1 e^x + C_2 e^{-x}$	
	The P.I. of $(D^2 + 4)y = \sin 2x$ is ...	
Q. 3)	A) P.I. = $\frac{-x \sin 2x}{4}$	A
	B) P.I. = $C_1 \cos 2x + C_2 \sin 2x$	
	C) P.I. = $\frac{\sin 2x}{8}$	
Q. 4)	D) P.I. = $\frac{-x \cos 2x}{4}$	C
	The P.I. of $(D^2 - 4D + 4)y = e^{2x}$ is	
	A) P.I. = $\frac{x^2}{2} e^{2x}$	
Q. 5)	B) P.I. = $\frac{1}{8} e^{-2x}$	B
	C) P.I. = $\frac{1}{16} e^{2x}$	
	D) P.I. = $\frac{x}{6} e^{-2x}$	
Q. 6)	Determine the constant k, so that the vector is $\vec{F} = (x + 3y)\mathbf{i} + (y - 2z)\mathbf{j} + (x + kz)\mathbf{k}$ is solenoidal.	A
	A) 3	
	B) 4	
Q. 7)	C) -2	B
	D) 1	
	Find the unit vector tangent to the space curve $x = t, y = t^2, z = t^3$ at $t = 1$	
Q. 8)	A) $\frac{i+j+k}{\sqrt{10}}$	B
	B) $\frac{i+2j+3k}{\sqrt{14}}$	
	C) $\frac{i+2j+k}{\sqrt{12}}$	
Q. 9)	D) $\frac{i+2j+3k}{\sqrt{6}}$	A
	Find grad r^n , where $\vec{r} = xi + yj + zk$	
	A) $n r^{n-2} \vec{r}$	
Q. 10)	B) $n r^{n+2} \vec{r}$	A
	C) $n r^{n-3} \vec{r}$	
	D) $n r^{n-2}$	

Q. 7)	The coefficient of regression of x on y is given by								B																
	$A) b_{xy} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\sqrt{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}}$				$B) b_{xy} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\frac{\sum y^2}{N} - \left(\frac{\sum y}{N}\right)^2}$																				
	$C) b_{xy} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}$				D) None of these																				
Q. 8)	If $b_{yx} = 0.9917$ and $b_{xy} = 0.8513$ then coefficient of correlation r =.....								B																
	A) 0.8225				B) 0.9188																				
	C) 0.7342				D) 0.9489																				
Q. 9)	The coefficient of regression of y on x is given by								C																
	$A) b_{yx} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\sqrt{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}}$				$B) b_{yx} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\frac{\sum y^2}{N} - \left(\frac{\sum y}{N}\right)^2}$																				
	$C) b_{yx} = \frac{\frac{\sum xy}{N} - \left(\frac{\sum x}{N}\right)\left(\frac{\sum y}{N}\right)}{\frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2}$				D) None of these																				
Q. 10)	Calculate mean \bar{x} from the following data.								A																
	<table><tr><td>x</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr><tr><td>y</td><td>4</td><td>6</td><td>9</td><td>12</td><td>9</td><td>6</td><td>4</td></tr></table>									x	7	8	9	10	11	12	13	y	4	6	9	12	9	6	4
	x	7	8	9	10	11	12	13																	
y	4	6	9	12	9	6	4																		
A) 10				B) 8																					
	C) 5				D) 6																				
Q. 11)	The probability density function of a random variable X is								B																
	<table><tr><td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>P(X)</td><td>k</td><td>3k</td><td>5k</td><td>7k</td><td>9k</td><td>11k</td><td>13k</td></tr></table>									X	0	1	2	3	4	5	6	P(X)	k	3k	5k	7k	9k	11k	13k
	X	0	1	2	3	4	5	6																	
P(X)	k	3k	5k	7k	9k	11k	13k																		
A) 0				B) 1/49																					
	C) 1/43				D) 1/50																				
Q.12)	A Continuous random variable x has p.d.f . as $f(x)=kx^2 \quad 0 \leq x \leq 2$ then find k.								D																
	A) 0				B) 3/5																				
	C) 3/2				D) 3/8																				
Q. 13)	In a Poisson distribution, $m=2.5$, find $P(x=3)$								C																
	A) 0.4233				B) 0.4152																				
	C) 0.2138				D) 0.0823																				
Q. 14)	If $m=14, s.d.=2.5$, Find S.N.V. z for $x=15$								B																
	A) -0.8				B) 0.4																				
	C) 0.8				D) 0																				
Q. 15)	Out of 1000 families of 3 children each, how many would you expect to have 2 boys?								A																
	A) 375				B) 400																				
	C) 320				D) 425																				
Q. 16)	If $f(t) = t \sin at$ then find $L\{f(t)\}$								C																
	A) $as/(s^2+a^2)^2$				B) $2s/(s^2+a^2)^2$																				
	C) $2as/(s^2+a^2)^2$				D) $4as/(s^2+a^2)^2$																				
Q. 17)	Find $L\{\frac{\sin t}{t}\}$								A																
	A) $\cot^{-1} s$				B) $\tan^{-1} s$																				
	C) $\sec^{-1} s$				D) $\sin^{-1} s$																				

Q. 18)	Find $L\{e^{-5t} \cos 2t\}$		B
	A) $\frac{s-5}{(s^2+10s+29)}$	B) $\frac{s+5}{(s^2+10s+29)}$	
	C) $\frac{s+5}{(s^2+2s+29)}$	D) $\frac{s}{(s^2+10s+29)}$	
Q. 19)	Find $L^{-1}\{\frac{1}{(s-2)^2}\}$		C
	A) $e^{4t}t$	B) $e^{-2t}t$	
	C) $e^{2t}t$	D) $e^{3t}t$	
Q. 20)	$L^{-1}\left\{\frac{3s+4}{s^2+16}\right\} = \dots\dots\dots$		C
	A) $3\sin 4t + \cos 4t$	B) $3\sin 4t - \cos 4t$	
	C) $3\cos 4t + \sin 4t$	D) $3\cos 4t - \sin 4t$	
Q.21)	Find a_0 in the Fourier Series expansion of the function $f(x) = \left(\frac{\pi-x}{2}\right)^2$ in $0 \leq x \leq 2\pi$		B
	A) $\frac{\pi^2}{3}$	B) $\frac{\pi^2}{12}$	
	C) $\frac{\pi^2}{4}$	D) $\frac{\pi^2}{2}$	
Q. 22)	Find a_0 in the Fourier Series expansion of the function $f(x) = e^x$ in $-\pi \leq x \leq \pi$		A
	A) $\frac{\sin h\pi}{\pi}$	B) $\frac{\sin h\pi}{2\pi}$	
	C) $\frac{\cos h\pi}{\pi}$	D) $\frac{\sin h\pi}{2}$	
Q. 23)	Find a_0 in the Fourier Series expansion of the function $f(x) = 4 - x^2$ in the $(0, 2)$		B
	A) $5/3$	B) $8/3$	
	C) $1/3$	D) 2	
Q. 24)	Find b_n in the Fourier Series expansion of the function $f(x) = x^2$ in $-\pi \leq x \leq \pi$		A
	A) 0	B) $2\sin x$	
	C) 5	D) $2\cos x$	
Q. 25)	Find b_n in the Fourier Series expansion of the function $f(x) = x$ in $-\pi \leq x \leq \pi$		B
	A) $\frac{4(-1)^{n+1}}{n}$	B) $\frac{2(-1)^{n+1}}{n}$	
	C) $\frac{(-1)^{n+1}}{n}$	D) $\frac{2(-1)^{n+1}}{\pi}$	

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Max. Marks- 50

Instructions:

1. Question No.1 is compulsory.
2. Figure to the right indicate full marks.
3. Use of non-programmable calculator is allowed.

BT	CO's	Q. No.					Marks	Weightage													
		Q.1	Attempt the following				20	40%													
L3	201.1	a	Solve $(D^2 + 3D + 2)y = e^{2x} \sin x$				6														
L3	201.2	b	If $\vec{f} = 3x^2i + 5xyj + xyz^3k$ then Find 1) Divergence of \vec{f} at (1,2,3) 2) Curl of \vec{f} at (1,2,3)				7														
L3	201.3	c	Find both equations of line of regression of x on y and y on x from the following data. Also find r. <table><tr><td>x</td><td>2</td><td>4</td><td>6</td><td>8</td><td>12</td><td>14</td></tr><tr><td>y</td><td>4</td><td>2</td><td>5</td><td>10</td><td>11</td><td>12</td></tr></table>				x		2	4	6	8	12	14	y	4	2	5	10	11	12
x	2	4	6	8	12	14															
y	4	2	5	10	11	12															
		Q.2	Attempt the following				15	60%													
L3	201.6 OR 201.4	a	Find Fourier series expansion of the function $f(x) = x $, $\pi \leq x \leq \pi$ OR From a box containing 100 transistors 20 of which are defective, 10 are selected at random. Find the probability that (i) all are defective (ii) all are non-defective (iii) at least two is defective.				7														
	201.5	b	Find (1) $L\left\{\frac{1-\cos 2t}{t}\right\}$ (2) $L^{-1}\left\{\frac{s}{(s^2+5s+6)}\right\}$ by Partial fractions.				8														
		Q.3	Attempt the following.				15	60%													
	201.4	a	The income distribution of a group of 10000 persons was found to be normal with mean Rs.7500 & Standard deviation Rs.500.What is the number of persons of this group who have income (i) Exceeding Rs.6680 (ii) Exceeding Rs.8320 (Given area under the normal curve between ordinates +1.64 is 0.8990)				7														

<p>201.5</p> <p>OR</p> <p>201.6</p>	<p>b</p>	<p>Find (1) $L\{te^{3t} \sin 2t\}$</p> <p>(2) $L^{-1}\left\{\frac{s}{(s^2+4)(s^2+9)}\right\}$ by Convolution theorem.</p> <p>OR</p> <p>Find Fourier series expansion of the function $f(x) = e^{-x}$ in $(0, 2\pi)$.</p>	<p>8</p>	