

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. = $(C_1 + C_2 x) e^x + (C_3 + C_4 x) e^{-x}$
	C) C.F. = $e^{-x}(C_1 \cos x + C_2 \sin x)$		D) C.F. = $C_1 e^x + C_2 e^{-x}$
Q. 2)	The P.I. of $(D^2 + 4)y = \sin 2x$ is ...	D	
	A) P.I. = $\frac{-x \sin 2x}{4}$		B) P.I. = $C_1 \cos 2x + C_2 \sin 2x$
	C) P.I. = $\frac{\sin 2x}{8}$		D) P.I. = $\frac{-x \cos 2x}{4}$
Q. 3)	The P.I. of $(D^2 - 4D + 4)y = e^{2x}$ is	A	
	A) P.I. = $\frac{x^2}{2} e^{2x}$		B) P.I. = $\frac{1}{8} e^{-2x}$
	C) P.I. = $\frac{1}{16} e^{2x}$		D) P.I. = $\frac{x}{6} e^{-2x}$
Q. 4)	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 .	C	
	A) 3		B) 4
	C) -2		D) 1
Q. 5)	Find the unit vector tangent to the space curve $x = t, y = t^2, z = t^3$ at $t = 1$	B	
	A) $\frac{i+j+k}{\sqrt{10}}$		B) $\frac{i+2j+3k}{\sqrt{14}}$
	C) $\frac{i+2j+k}{\sqrt{12}}$		D) $\frac{i+2j+3k}{\sqrt{6}}$
Q. 6)	Find grad r^n , where $\vec{r} = xi + yj + zk$	A	
	A) $n r^{n-2} \vec{r}$		B) $n r^{n+2} \vec{r}$
	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) $b_{xy} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\sqrt{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}}$	B) $b_{xy} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\sqrt{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}}}$																	
	C) $b_{xy} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}}$	D) None of these																	
Q. 8)	If $b_{yx} = 0.9917$ and $b_{xy} = 0.8513$ then coefficient of correlation $r = \dots$		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) $b_{yx} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\sqrt{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}}$	B) $b_{yx} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\sqrt{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}}}$																	
	C) $b_{yx} = \frac{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum x^2 - (\frac{\sum x}{N})^2}}{\frac{\sum xy - (\frac{\sum x}{N})(\frac{\sum y}{N})}{\frac{\sum y^2 - (\frac{\sum y}{N})^2}}}$	D) None of these																	
Q. 10)	Calculate mean \bar{x} from the following data.		A																
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <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> </tbody> </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 border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <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> </tbody> </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 $f(x) = kx^2$ $0 \leq x \leq 2$ 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 $L^{-1}\left\{\frac{1}{(s-2)^2}\right\}$		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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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.	7															
			<table border="1"> <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>	