K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Sem IV - EXTC
Exthas

Instructions:
(1) All questions are compulsory.
(2) Draw neat diagrams wherever applicable.
(3) Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	Solve any six questions out of eight:	12		
i)	Find the value of the integral $\int_0^{1+i}(x^2 - iy)\,dz$ along the path y = x	2	1	Ap
ii)	Evaluate $\int_c \frac{z-1}{(z-3)(z+7)}\,dz$, where c is the circle $|z| = 1$	2	1	Ap
iii)	If for a Poisson variate $m = 2$, find the probabilities of $x = 1$ using recurrence relation of Poisson distribution.	2	3	Ap
iv)	Verify Cauchy-Schwartz inequality for $u = (2, 3, 1)$ and $v = (3, 0, 4)$.	2	4	Ap
v)	Write the matrix corresponding to the quadratic form	2	5	Ap
vi)	State two different forms of Euler-Lagrange's equation.	2	6	Ap
vii)	Given two lines of regression $6y - 5x = 90$, $15x - 8y = 130$, $find\ \bar{x}$ and $\bar{y}$.	2	2	Ap
viii)	A discrete random variable has the probability density function given below. Find the value of k and the mean.	2	3	Ap
Q2	Solve any four questions out of six.	16		
i)	Find the extremals of $\int_{x_1}^{x_2}(x + y')\,y'\,dx$.	4	6	Ap
ii)	Fit a straight line to the given data	4	2	Ap

Q1 viii) table:

X	-2	-1	0	1	2	3
P(X = x)	0.2	k	0.1	2k	0.1	2k

Q2 ii) table:

X	10	12	15	23	20
Y	14	17	23	25	21

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(B.Tech.) Program: B.Tech. (Electronics and Telecommunication Engineering) Scheme: I
Examination: SY   Semester: IV
Course Code: 1UEXC401 and Course Name: Applications of Mathematics in Engineering-II

Date of Exam: 25th May, 2023

Duration: 2.5 Hours

Max. Marks: 60

iii)	Use Gram-Schmidt process to transform the basis $\{u_1, u_2, u_3\}$ into an orthonormal basis where $u_1 = (1,1,1)$, $u_2 = (-1,1,0)$, $u_3 = (1,2,1)$	4	4	Ap
iv)	For a normal variate with mean 2.5 and standard deviation 3.5, find the probability that $2 \leq X \leq 4.5$.	4	3	Ap
v)	Determine whether the quadratic form $4x_1^2 + 4x_2^2 + 4x_3^2 + 4x_1x_2 + 4x_1x_3 + 4x_2x_3$ is positive definite or not.	4	5	Ap
vi)	Using Cauchy's Residue theorem evaluate $\int_C \frac{\sin 3z}{z + \frac{\pi}{2}} dz$ where C is $\|z\| = 1$.	4	1	Ap

Q.3	Solve any two questions out of three.	16		
i)	Calculate Spearman's rank correlation coefficient between X and Y (see table below)	8	2	Ap
ii)	Expand $f(z) = \frac{2}{(z-1)(z-2)}$ in the regions (i) $\|z\| < 1$ (ii) $1 < \|z\| < 2$ (iii) $\|z\| > 2$.	8	1	Ap
iii)	Find singular value decomposition of $\begin{bmatrix} 4 & 4 \\ -3 & -3 \end{bmatrix}$	8	5	Ap

Q.3 i) table:

X	10	12	18	18	15	40
Y	12	18	25	25	50	25

Q.4	Solve any two questions out of three.	16		
i)	If mean of the following distribution is 16 find m , n and variance. (see table below)	8	3	Ap
ii)	A) Is $W = \{(a,0,0)/a \in R\}$ a subspace of R^3 ? B) Find a unit vector in R^3 orthogonal to both $u = (1,0,1)$, $v = (0,1,1)$.	8	4	Ap
iii)	Using Rayleigh-Ritz method solve the following boundary value problem $\int_0^1 (2xy + y^2 - y'^2)dx$, $0 \leq x \leq 1$, given $y(0) = 0, y(1) = 0$	8	6	Ap

Q.4 i) table:

X	8	12	16	20	24
$P(X = x)$	$\frac{1}{8}$	m	n	$\frac{1}{4}$	$\frac{1}{12}$

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