21BT11450101

PRN: Course Code : UAM401

Second Year **AIML** End Semester Examination Summer 2024

Statistics and Numerical Techniques -II

Day and Date: **21 MAY 2024**, Tuesday Max Marks: **100**

Time : 10 to 1 pm Duration: **03** hrs

Instructions: i) All questions are compulsory.
ii) Figures to right indicate full marks.
iii) Non Programmable calculator is allowed

		Marks	Bloom Level	CO
Q.1	**Attempt the following**			
a)	Show that $u = e^x \cos y$ is harmonic function. Find the corresponding analytic function and harmonic conjugate $f(z)$.	08	L3	CO1
b)	If $f(z) = u + iv$ is analytic and $u - v = (x-y)(x^2 + 4xy + y^2)$, find $f(z)$ in terms of z.	08	L3	CO1
	OR			
b)	i) Determine the constant k if $f(z) = \frac{1}{2}\log(x^2+y^2) + i\tan^{-1}\left(\frac{kx}{y}\right)$ is analytic.	08	L3	CO1
	ii) Determine the constant p if $f(z) = r^2\cos 2\theta + ir^2 \sin p\theta$ is analytic.			
Q.2	**Attempt the following**			
a)	Evaluate $\int_0^{1+i} (x - y + ix^2)\,dz$ along i) the line from $z = 0$ to $z = 1+i$, ii) the real axis from $z = 0$ to $z = 1$ and then along the line parallel to imaginary axis from $z = 1$ to $z = 1+i$	08	L2	CO1
b)	Evaluate $\int_C \frac{e^z}{(z-1)(z-2)}\,dz$, where C is $\lvert z\rvert = 3$	08	L3	CO1
	OR			
b)	Find the bilinear transform which maps the points $z = 0, -i, -1$ on to the points $w = i$, 1, 0.	08	L3	CO1

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Q.3 **Attempt any two from the following**

a) Find the arithmetic mean, geometric mean, harmonic mean, median and mode for the following data. 08 L3 CO2

x	2	3	4	5	6	7	8
f	2	4	6	2	3	2	1

b) Find range, coefficient of range, quartiles, quartile deviation, coefficient of quartile deviation and inter quartile range for the following data. 08 L3 CO2

x	130	135	140	146	148	149	150	157
f	3	5	6	6	3	5	1	1

Q.6

c) Calculate standard deviation, Variance and mean square deviation about 240 for the following data. 08 L3 CO2

240.12, 240.13, 240.12, 240.15, 240.17, 240.15, 240.17, 240.16, 240.22, 240.21

Q.4 **Attempt any two from the following**

a) If random variable X has the following are probability density function 08 L2 CO2

x	0	1	2	3	4	5	6	7
$p(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2+k$

Then find k, $P(x<6), P(x\geq 6), P(3<x\leq 6)$.

b) In a certain factory producing cycle tyres, there is a small chance of 1 of 500 tyres to be defective. The tyres are supplied in a lot of 10. Using Poisson distribution, calculate the approximate number of lots containing no defective, one defective and two defective tyres respectively in a consignment of 10000 lots. 08 L3 CO2

c) Weights of 4000 students are found to be normally distributed with mean 50 kgs and standard deviation 5 kgs. Find the number of students with weights i) less than 45 kgs, ii) between 45 to 60 kgs. 08 L4 CO2

(Use Standard normal table which is given at page 4 of Question paper.)

Q.5 **Attempt any Two of the following**

a) Fit a straight line $y = a + bx$ to the following data 09 L3 CO3

x	0	1	2	3	4	5
y	1	2	3	4.5	6	7.5

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b) By the method of least squares find the values of a,b,c in the law $y = a + bx + cx^2$ to fit the following data — 09 L3 CO3

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

c) Find the line of regression y on x for the following data and estimate y corresponding to $x = 8$ — 09 L4 CO3

x	1	2	3	4	5	6	7
y	5	9	8	10	11	9	11

Attempt any Two of the following

a) i) Find the directional derivative of $\phi(x,y,z) = xy^2 + yz^3$ at the point $(2,-1,1)$ in the direction of $\bar{a} = i + 2j + 2k$. — 09 L3 CO4

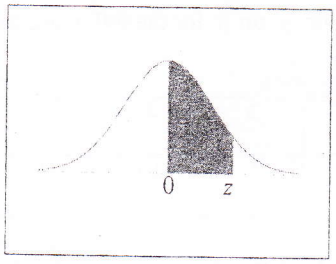
ii) A fluid motion is given by $\bar{F} = 2xyz^3 i + x^2 z^3 j + 3x^2 yz^2 k$ Show that the motion is irrotational and hence find its scalar potential

b) If $\bar{a}$ is constant vector and $\bar{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then find — 09 L3 CO4

i) $\nabla(\bar{a}\cdot\bar{r})$, ii) $\nabla\cdot\bar{a}$, iii) $Curl\,\bar{a}$.

c) If $\bar{F} = \nabla(xy + yz + zx)$ then find its divergence and curl. — 09 L3 CO4

Standard Normal Distribution Table



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998

Gilles Cazelais. Typeset with LaTeX on April 20, 2006.