

<b>Hi-Tech Institute of Engineering &amp; Technology</b>	
<b>DEPARTMENT OF COMPUTER SCIENCE &amp; ENGINEERING</b>	
<b>MODEL TEST PAPER I, ODD SEMESTER-2023-24,</b>	
<b>Semester: 3rd</b>	<b>Course/Branch: CS/IT/AI-ML</b>
<b>Subject Code: BAS303</b>	<b>Subject Name: MATHEMATICS IV</b>
<b>Faculty Name: SHIVANI SHUKLA</b>	
<b>Time: 3: 00 Hours</b>	<b>Total Marks: 70</b>

**Note: Attempt all Sections. If you require any missing data, then choose suitably.**

### SECTION A

**1. Attempt all questions in brief. 2X7=14**

Q No.	Question	Marks	CO																
a.	From partial differential equations of the equations by eliminating the arbitrary constants: $z = ax + by + ab$	2	1																
b.	Solve: $(D^3 - 4D^2D' + 4DD'^2)z = 0$	2	1																
c.	Write the wave equation in two dimensions.	2	2																
d.	If $P(A) = \frac{1}{4}$ , $P(B) = \frac{1}{2}$ , $P(A \cup B) = \frac{5}{8}$ , find the value of $P(A \cap B)$ .	2	4																
e.	Find the arithmetic mean of the following frequency distribution: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">x</td> <td style="width: 10%;">1</td> <td style="width: 10%;">2</td> <td style="width: 10%;">3</td> <td style="width: 10%;">4</td> <td style="width: 10%;">5</td> <td style="width: 10%;">5</td> <td style="width: 10%;">7</td> </tr> <tr> <td>y</td> <td>5</td> <td>9</td> <td>12</td> <td>17</td> <td>14</td> <td>10</td> <td>6</td> </tr> </table>	x	1	2	3	4	5	5	7	y	5	9	12	17	14	10	6	2	3
x	1	2	3	4	5	5	7												
y	5	9	12	17	14	10	6												
f.	Define Alternative Hypothesis.	2	5																
g.	What do you mean by "statistical quality control (SQC)"?	2	5																

### SECTION B

**2. Attempt any three of the following: 7X3=21**

Q No.	Question	Marks	CO												
a.	Solve the following partial differential equation by using the method of separation of variables: $\frac{\partial z}{\partial x} + \frac{\partial^2 z}{\partial y^2} = 0$ ; $z(x,0) = 0$ , $z(x,\pi) = 0$ , $z(0,y) = 4 \sin 3y$	7	2												
b.	Solve $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$ .	7	1												
c.	Use the method of least squares to the curve of the form $y = ab^x$ to the following data: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">X</td> <td style="width: 10%;">2</td> <td style="width: 10%;">3</td> <td style="width: 10%;">4</td> <td style="width: 10%;">5</td> <td style="width: 10%;">6</td> </tr> <tr> <td>y</td> <td>8.3</td> <td>15.4</td> <td>33.1</td> <td>65.2</td> <td>127.4</td> </tr> </table>	X	2	3	4	5	6	y	8.3	15.4	33.1	65.2	127.4	7	3
X	2	3	4	5	6										
y	8.3	15.4	33.1	65.2	127.4										
d.	The mean weight obtained from a random sample of size 100 is 64 gm. The S.D. of the weight distribution of the population is 3gm. Test the statement that the mean weight of the population is 67 gm at 5% level of significance, Also set up 99% confidence limit of the mean weight of the population.	7	5												
e.	Calculate the moment generating function of the discrete Binomial distribution. Also find the first and second moments about the mean.	7	4												

**SECTION C**

**3. Attempt any one part of the following:**

**7X1=7**

Q No.	Question	Marks	CO
a.	Solve: $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$	7	1
b.	Solve: $2x + p^2 + qy + 2y^2 = 0$	7	1

**4. Attempt any one part of the following:**

**7X1=7**

Q No.	Question	Marks	CO
a.	Solve the Laplace equation $u_{xx} + u_{yy} = 0, x \in (0,1), y \in (0,1)$ with the condition $u(x,0) = u(x,1) = 0$ and $u(0,y) = 0, u(1,y) = f(y)$ by using the method of separation of variable.	7	2
b.	Find the Fourier sine transform of $\frac{e^{-ax}}{x}, a > 0$ . Hence find Fourier sine transform of $(1/x)$ .	7	2

**5. Attempt any one part of the following:**

**7X1=7**

Q No.	Question	Marks	CO														
a.	The first four moments of a distribution about the value 4 of the variables are - 1.5, 17, -30 and 80. Find all four moments about mean. Also find kurtosis.	7	3														
b.	Fit the curve $pv^{\gamma} = K$ to the following data:	7	3														
	<table border="1"> <thead> <tr> <th>p(kg/cm<sup>2</sup>)</th> <th>0.5</th> <th>1</th> <th>1.5</th> <th>2</th> <th>2.5</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>v(liters)</td> <td>1620</td> <td>1000</td> <td>750</td> <td>650</td> <td>520</td> <td>460</td> </tr> </tbody> </table>	p(kg/cm <sup>2</sup> )	0.5	1	1.5	2	2.5	3	v(liters)	1620	1000	750	650	520	460		
p(kg/cm <sup>2</sup> )	0.5	1	1.5	2	2.5	3											
v(liters)	1620	1000	750	650	520	460											

**6. Attempt any one part of the following:**

**7X1=7**

Q No.	Question	Marks	CO
a.	The number of accidents in a year involving taxi drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers such that (i) No accident in a year (ii) More than three accidents in a year. (Given $e^{-3} = 0.04979$ )	7	4
b.	In a normal distribution, 12% of the items are under 30 and 85% items are under 60. Find the mean and standard deviation.	7	4

**7. Attempt any one part of the following:**

**7X1=7**

Q No.	Question	Mark s	C O																						
a.	Distinguish between the np-chart and p-chart. Following is the data of defectives of 10 samples of size 100 each. Construct np-chart and examine whether the process is in statistical control	7	5																						
b.	The score of 10 candidates obtained in tests before and after attending some coaching classes are given below:	7	5																						
	<table border="1"> <tbody> <tr> <td>Before</td> <td>54</td> <td>76</td> <td>92</td> <td>65</td> <td>75</td> <td>78</td> <td>66</td> <td>82</td> <td>80</td> <td>78</td> </tr> <tr> <td>After</td> <td>60</td> <td>80</td> <td>86</td> <td>72</td> <td>80</td> <td>72</td> <td>66</td> <td>88</td> <td>82</td> <td>73</td> </tr> </tbody> </table>	Before	54	76	92	65	75	78	66	82	80	78	After	60	80	86	72	80	72	66	88	82	73		
Before	54	76	92	65	75	78	66	82	80	78															
After	60	80	86	72	80	72	66	88	82	73															
	Is the coaching for the test effective? Test at 5% level of significance.																								

