

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

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 function: $z = f(x^2 - y^2)$	2	1
b.	Find particular integral (P.I.): $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$	2	1
c.	Write the wave equation in two dimensions.	2	2
d.	Identify the following statement is true or false, "For a Binomial Distribution, mean is 6 and variance is 9.	2	4
e.	Write the formulas of Karl Pearson correlation coefficient and write the rank of correlation.	2	3
f.	Distinguish between the np-chart and p-chart.	2	5
g.	Explain "t- test" for small samples.	2	4

SECTION B

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

Q No.	Question	Marks	CO																
a.	Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0,t) = 0, u(l,t) = 0, (t > 0)$ and the initial condition $u(x,0) = 3 \sin \frac{\pi x}{l}$: where l being the length of the bar.	7	2																
b.	Fit a second degree parabola to the following data: <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">x</td> <td style="padding: 2px;">1.0</td> <td style="padding: 2px;">1.5</td> <td style="padding: 2px;">2.0</td> <td style="padding: 2px;">2.5</td> <td style="padding: 2px;">3.0</td> <td style="padding: 2px;">3.5</td> <td style="padding: 2px;">4.0</td> </tr> <tr> <td style="padding: 2px;">y</td> <td style="padding: 2px;">1.1</td> <td style="padding: 2px;">1.3</td> <td style="padding: 2px;">1.6</td> <td style="padding: 2px;">2.0</td> <td style="padding: 2px;">2.7</td> <td style="padding: 2px;">3.4</td> <td style="padding: 2px;">4.1</td> </tr> </table>	x	1.0	1.5	2.0	2.5	3.0	3.5	4.0	y	1.1	1.3	1.6	2.0	2.7	3.4	4.1	7	3
x	1.0	1.5	2.0	2.5	3.0	3.5	4.0												
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1												
c.	If X variable follow the Poisson distribution such that $P(X=2)=9 P(X=4)+90 P(X=6)$. Find the mean, variance and distribution.	7	4																
d.	A machine is producing bolts of which a certain fraction is defective. A random sample of 400 is taken from a large batch and is found to contain 30 defective bolts. Does this indicate that the proportion of defectives is larger than claimed by the manufacturer where the manufacturer claims that only 5% of his product are defective. Find 95% confidence limit of the proportion of defective bolts in batch.	7	5																
e.	Solve $D(D + D' - 1)(D + 3D' - 2)z = x^2 - 4xy + 2y^2$	7	1																

SECTION C

3. Attempt any one part of the following: 7X1=7

Q No.	Question	Marks	CO
a.	Solve: $(p^2 + q^2)y = qz$	7	1
b.	Solve: $r - 4s + 4t = e^{2x+y}$	7	1

4. Attempt any one part of the following: 7X1=7

Q No.	Question	Marks	CO
a.	Find Fourier Cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$	7	2
b.	Solve the following partial differential equation by method of separation of variables: $\frac{\partial u}{\partial t} - \frac{\partial u}{\partial x} + 2u = 0, u(x,0) = 1010e^{-x} - 6e^{-4x}.$	7	2

5. Attempt any one part of the following: 7X1=7

Q No.	Question	Marks	CO																																	
a.	Ten students got the following percentage of marks in principles of Economics and Statistics: <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Roll no.</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> <th>7</th> <th>8</th> <th>9</th> <th>10</th> </tr> </thead> <tbody> <tr> <td>M. in Eco</td> <td>78</td> <td>36</td> <td>98</td> <td>25</td> <td>75</td> <td>82</td> <td>90</td> <td>62</td> <td>65</td> <td>39</td> </tr> <tr> <td>M. in statistics</td> <td>84</td> <td>51</td> <td>91</td> <td>60</td> <td>68</td> <td>62</td> <td>86</td> <td>58</td> <td>53</td> <td>47</td> </tr> </tbody> </table> Calculate the coefficient of correlation.	Roll no.	1	2	3	4	5	6	7	8	9	10	M. in Eco	78	36	98	25	75	82	90	62	65	39	M. in statistics	84	51	91	60	68	62	86	58	53	47	7	3
Roll no.	1	2	3	4	5	6	7	8	9	10																										
M. in Eco	78	36	98	25	75	82	90	62	65	39																										
M. in statistics	84	51	91	60	68	62	86	58	53	47																										
b.	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%; text-align: center;"> <thead> <tr> <th>X</th> <th>2</th> <th>3</th> <th>4</th> <th>5</th> <th>6</th> </tr> </thead> <tbody> <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> </tbody> </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																															

6. Attempt any one part of the following: 7X1=7

Q No.	Question	Marks	CO
a.	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
b.	Calculate the moment generating function of the discrete Binomial distribution. Also find the first and second moments about the mean.	7	4

7. Attempt any one part of the following: 7X1=7

Q No.	Question	Marks	CO											
a.	From the following table regarding the colour of eyes of father and son, test if the colour of son's eye is associated with that of father. <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th rowspan="3">Eye colour of father</th> <th colspan="2">Eye colour of son</th> </tr> <tr> <th>Light</th> <th>No Light</th> </tr> </thead> <tbody> <tr> <td>Light</td> <td>471</td> <td>51</td> </tr> <tr> <td>No Light</td> <td>148</td> <td>230</td> </tr> </tbody> </table>	Eye colour of father	Eye colour of son		Light	No Light	Light	471	51	No Light	148	230	7	5
Eye colour of father	Eye colour of son													
	Light		No Light											
	Light	471	51											
No Light	148	230												
b.	The average income of person was Rs. 210 with S.D. of Rs. 10 in sample of 100	7	5											

	<p>people of a city. For another sample of 150 persons, the average income was Rs. 220 with S.D. of Rs. 12. The S.D. of income of the people of the city was Rs. 11. Test whether there is any significant difference between the average incomes of the localities.</p>		
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