



BUDDHA INSTITUTE OF TECHNOLOGY, GIDA, GORAKHPUR
DEPARTMENT OF MECHANICAL ENGINEERING
PRE AKTU EXAM (EVEN SEMESTER 2022-23)
July-2023

Course:	B.Tech.	Semester:	IV
Subject:	Maths-IV	Subject Code:	KAS402
M.M.	100	Time:	3:00 hrs
			Roll No.-

SECTION-A

1. Attempt all questions. Each questions carry equal marks.

Marks: 10*2=20

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	Find the general solution of $(D^2 + DD')z = 0$	L3	CO1
b.	Use Cauchy's method of Characteristics to solve $u_x + u_y = 2x + 2y$, where $u(x, 0) = x^2$	L3	CO1
c.	Examine the nature of partial differential equation $(1 + x^2) \frac{\partial^2 u}{\partial x^2} + (5 + 2x^2) \frac{\partial^2 u}{\partial x \partial t} + (4 + x^2) \frac{\partial^2 u}{\partial t^2} = 0$	L3	CO2
d.	Find the solution of one dimensional heat flow in steady state condition.	L3	CO2
e.	In an asymmetrical distribution mean is 16 and median is 20. Calculate the mode of the distribution.	L1	CO3
f.	The regression equation calculated from a set of observation for two random variable are $x = -0.4y + 6.4$ and $y = -0.6x + 4.6$, Calculate mean values of x and y.	L3	CO3
g.	Find the mean of the Binomial Distribution $B(4, \frac{1}{3})$.	L1	CO4
h.	What is the probability that a leap year, selected at random, will contain 53 Sundays?	L3	CO4
i.	Distinguish between process control and product control. And also "SQC".	L1	CO5
j.	Distinguish between null hypothesis (H_0) and alternate hypothesis (H_1).	L1	CO5

SECTION-B

2. Attempt ALL questions. Each questions carry equal marks.

Marks: 3*10= 30

Q. No.	Question	Level of Taxonomy	Course Outcome																						
a.	An insulated rod of length l has its ends A and B maintained 0°C and 100°C respectively until steady state conditions prevail. If B is suddenly reduced to 0°C and maintained at 0°C . Find the temperature at a distance x from A at time t	L3	CO2																						
b.	Calculate the rank coefficient from the sales and expenses of 10 firms as given below: <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>45</td> <td>56</td> <td>39</td> <td>54</td> <td>45</td> <td>40</td> <td>56</td> <td>60</td> <td>30</td> <td>36</td> </tr> <tr> <td>Y</td> <td>40</td> <td>36</td> <td>30</td> <td>44</td> <td>36</td> <td>32</td> <td>45</td> <td>42</td> <td>20</td> <td>36</td> </tr> </table>	X	45	56	39	54	45	40	56	60	30	36	Y	40	36	30	44	36	32	45	42	20	36	L3	CO3
X	45	56	39	54	45	40	56	60	30	36															
Y	40	36	30	44	36	32	45	42	20	36															
c.	Find the moment generating function of the discrete Poisson distribution given by $f(x) = \frac{e^{-m} \cdot m^x}{x!}$, Also find the first and second moments about mean and variance.	L3	CO4																						

SECTION-C

3. Attempt ANY ONE questions. Each questions carry equal marks.

Marks: 1*10=10

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	Find complete integral of $p^2x + q^2y = z$ OR Solve $(D-D'-1)(D-D'-2) = \text{Sin}(2x+3y)$	L3	CO1
b.	Solve $x^2r - y^2t + xp - yq = \log x$	L3	CO1

4. Attempt ANY ONE questions. Each questions carry equal marks.

Marks: 1*10=10

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to the conditions $u(0, y) = 0, u(x, 0) = 0, u(1, y) = 0$ and $u(x, 1) = 100 \sin \pi x$	L3	CO2
b.	Solve $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$, given $u(0, y) = 4e^{-y} - e^{-5y}$, by the method of separation of variables	L3	CO2

5. Attempt ANY ONE questions. Each questions carry equal marks.

Marks: 1*10=10

Q. No.	Question	Level of Taxonomy	Course Outcome																				
a.	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</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">9</td> </tr> <tr> <td style="padding: 2px;">y</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">10</td> <td style="padding: 2px;">11</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">13</td> <td style="padding: 2px;">5</td> </tr> </table>	x	1	2	3	4	5	6	7	8	9	y	2	6	7	8	10	11	8	13	5	L3	CO3
x	1	2	3	4	5	6	7	8	9														
y	2	6	7	8	10	11	8	13	5														
b.	If θ is the acute angle between the two lines of regression then prove that $\tan \theta = \frac{1-r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ Where r, σ_x, σ_y have their usual meanings. Give the significance of the formula when $r = 0$ and $r = \pm 1$	L3	CO3																				

6. Attempt ANY ONE questions. Each questions carry equal marks.

Marks: 1*10=10

Q. No.	Question	Level of Taxonomy	Course Outcome
a.	The life (in hours) of electronic tube of certain type is supposed to be normally distributed with $\mu = 155$ hours and $\sigma = 19$ hours. What is the probability that the life of the tube will be (i) between 136 hours and 174 hours (ii) between 117 hours and 193 hours (iii) less than 117 hours (iv) More than 193 hours?	L3	CO4
b.	Out of 800 families with four children each, how many families would be expected to have: (i) 2 boys and 2 girls (ii) Atleast one boys (iii) No girls (iv) At most two girls?	L3	CO4

7. Attempt ANY ONE questions. Each questions carry equal marks.

Marks: 1*10=10

Q. No.	Question	Level of Taxonomy	Course Outcome																						
a.	Distinguish between the $n\bar{p}$ -chart and p-chart. The following data of defective of 10 sample of size 100 each. Construct $n\bar{p}$ - Chart and give your comments: <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Sample No</td> <td style="padding: 2px;">1</td> <td style="padding: 2px;">2</td> <td style="padding: 2px;">3</td> <td style="padding: 2px;">4</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">7</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">10</td> </tr> <tr> <td style="padding: 2px;">No of defectives</td> <td style="padding: 2px;">6</td> <td style="padding: 2px;">9</td> <td style="padding: 2px;">12</td> <td style="padding: 2px;">5</td> <td style="padding: 2px;">12</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">8</td> <td style="padding: 2px;">16</td> <td style="padding: 2px;">13</td> <td style="padding: 2px;">7</td> </tr> </table>	Sample No	1	2	3	4	5	6	7	8	9	10	No of defectives	6	9	12	5	12	8	8	16	13	7	L3	CO5
Sample No	1	2	3	4	5	6	7	8	9	10															
No of defectives	6	9	12	5	12	8	8	16	13	7															
b.	Test the effectiveness of inoculation against cholera, the following table was obtained: <table border="1" style="margin: 5px auto; border-collapse: collapse;"> <tr> <td></td> <td style="padding: 2px;">Attacked</td> <td style="padding: 2px;">Not attacked</td> <td style="padding: 2px;">Total</td> </tr> <tr> <td style="padding: 2px;">Inoculated</td> <td style="padding: 2px;">30</td> <td style="padding: 2px;">160</td> <td style="padding: 2px;">190</td> </tr> <tr> <td style="padding: 2px;">Not inoculated</td> <td style="padding: 2px;">140</td> <td style="padding: 2px;">460</td> <td style="padding: 2px;">600</td> </tr> <tr> <td style="padding: 2px;">Total</td> <td style="padding: 2px;">170</td> <td style="padding: 2px;">620</td> <td style="padding: 2px;">790</td> </tr> </table> Use Chi-Square test to defend or refute the statement that the inoculations prevent attack from cholera.		Attacked	Not attacked	Total	Inoculated	30	160	190	Not inoculated	140	460	600	Total	170	620	790	L3	CO5						
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