

Code: 20BS1301

**II B.Tech - I Semester – Regular / Supplementary Examinations
DECEMBER 2023**

**NUMERICAL AND STATISTICAL METHODS
(Common for CIVIL, ME)**

Duration: 3 hours

Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level

CO – Course Outcome

			BL	CO	Max. Marks													
UNIT-I																		
1	a)	Find the smallest positive root of $x^3 - x^2 - 1 = 0$ up to 2 nd decimal accuracy using Bisection method.	L3	CO2	7 M													
	b)	Find the missing values in the following table. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td> <td>0</td> <td>5</td> <td>10</td> <td>15</td> <td>20</td> <td>25</td> </tr> <tr> <td>Y</td> <td>6</td> <td>10</td> <td>--</td> <td>17</td> <td>--</td> <td>31</td> </tr> </table>	X	0	5	10	15	20	25	Y	6	10	--	17	--	31	L3	CO2
X	0	5	10	15	20	25												
Y	6	10	--	17	--	31												
OR																		
2	a)	Find the value of the function and slope at $x = 1.5$ using Lagranges interpolation of the following data. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>0</td> <td>1</td> <td>2</td> </tr> <tr> <td>y</td> <td>1</td> <td>2</td> <td>5</td> </tr> </table>	x	0	1	2	y	1	2	5	L3	CO2	7 M					
	x	0	1	2														
y	1	2	5															
b)	Prove that $1 + \mu^2 \delta^2 = (1 + \frac{1}{2} \delta^2)^2$	L2	CO1	7 M														

UNIT-II

3	a)	Using Simpson's 3/8 rule evaluate $\int_0^6 \frac{dx}{1+x^2}$ by dividing the range into 6 equal parts. Compare the numerical value with the exact value.	L3	CO2	7 M														
	b)	Compute $f'(x)$ at $x=16$ from the following table using Newton's Forward interpolation formula. <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">15</td> <td style="padding: 5px;">17</td> <td style="padding: 5px;">19</td> <td style="padding: 5px;">21</td> <td style="padding: 5px;">23</td> <td style="padding: 5px;">25</td> </tr> <tr> <td style="padding: 5px;">$f(x)$</td> <td style="padding: 5px;">8</td> <td style="padding: 5px;">25</td> <td style="padding: 5px;">32</td> <td style="padding: 5px;">60</td> <td style="padding: 5px;">76</td> <td style="padding: 5px;">80</td> </tr> </table>	x	15	17	19	21	23	25	$f(x)$	8	25	32	60	76	80	L4	CO4	7 M
x	15	17	19	21	23	25													
$f(x)$	8	25	32	60	76	80													

OR

4	Apply the Runge-Kutta fourth order method to find $y(0.2)$ and $y(0.4)$ for the differential equation $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$	L3	CO2	14 M
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UNIT-III

5	a)	Find the constant 'k' such that $f(x) = \begin{cases} kx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ Determine (i) k (ii) $P(1 < X < 2)$	L3	CO3	7 M
	b)	20% of the items produced from a goods factory are defective . If we choose 5 items randomly then find the probability of <ul style="list-style-type: none"> i) None is defective ii) One is defective iii) $P(1 < X < 4)$ 	L3	CO3	7 M

OR

6	a)	The average no. of phone calls per minute coming into a switch board between 2 P.M & 4 P.M is 2.5. Determine the probability during 1 particular minute. There will be i) 4 are fewer calls ii) More than 6 calls	L3	CO3	7 M
	b)	The marks obtained in statistics in a certain examination found to be normally distributed. If the 15% of the students got ≥ 60 marks, 40% of the students got < 30 marks. Assuming the distribution to be normal, find the mean and standard deviation.	L3	CO3	7 M

UNIT-IV

7	a)	Write the Procedure for Testing of Hypothesis.	L2	CO5	7 M
	b)	The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm. respectively. Can the samples be regarded as drawn from the same population of standard deviation 2.5 cm.	L4	CO5	7 M

OR

8	a)	An ambulance service claims that it takes on the average less than 10 minutes to reach its destination in emergency calls. A sample of 36 calls has a mean of 11 minutes and the variance of 16 minutes. Test the claim at 0.05 level of significance.	L3	CO5	7 M
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	b)	Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal are same at 5% level.	L4	CO5	7 M
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UNIT-V

9	a)	Write the characteristics of student t-distribution. Find the value of 'k' for a random sample of size 24 from a normal distribution is such that $P(-2.069 < t < k) = 0.965$	L3	CO5	7 M
	b)	A process for making certain ball bearings is under control if the diameters of the bearing have a mean of 0.5 cm. If a random sample of 10 of these bearings has a mean diameter of 0.5060cm. and S.D. of 0.0040cm is the process under control.	L4	CO5	7 M

OR

10	The time taken by workers in performing a job by Method-I and Method-II is given below.		L4	CO5	14 M																
		<table border="1" style="margin-left: 40px;"> <tr> <td>Method-I</td> <td>20</td> <td>16</td> <td>26</td> <td>27</td> <td>23</td> <td>22</td> <td>-</td> </tr> <tr> <td>Method-II</td> <td>27</td> <td>33</td> <td>42</td> <td>35</td> <td>32</td> <td>34</td> <td>38</td> </tr> </table>	Method-I	20	16	26	27	23	22	-	Method-II	27	33	42	35	32	34	38			
Method-I	20	16	26	27	23	22	-														
Method-II	27	33	42	35	32	34	38														
		Do the data show that the variances of time distribution from population from which these samples are drawn do not differ significantly.																			