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BTECH
(SEM IV) THEORY EXAMINATION 2021-22
MATHEMATICS-III

Time: 3 Hours

Total Marks: 100

Notes:

- Attempt all Sections and Assume any missing data.
- Appropriate marks are allotted to each question, answer accordingly.

SECTION-A	Attempt All of the following Questions in brief	Marks (10X2=20)
Q1(a)	Define Analytic function.	
Q1(b)	Show the function $u = x^3 - 3xy^2$ is harmonic	
Q1(c)	Define change of scale property of F-Transform.	
Q1(d)	State the convolution theorem for Z-transform.	
Q1(e)	How can we measure Kurtosis?	
Q1(f)	Write the formula for rank correlation.	
Q1(g)	State Newton-Gregory forward interpolation formula.	
Q1(h)	Define order of convergence of any iterative method.	
Q1(i)	Write Simpson 1/3 Rule	
Q1(j)	Write Runge -Kutta Method of 4 th order.	

SECTION-B	Attempt ANY THREE of the following Questions	Marks (3X10=30)												
Q2(a)	Evaluate the following integral using Cauchy Integral formula $\int_C \frac{z}{(z-1)(z-3)} dz; \text{ where } C \text{ is the circle } z =4$													
Q2(b)	Find the Fourier cosine transform of $\frac{1}{1+x^2}$.													
Q2(c)	Find line of regression x on y for the following data: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>x</td> <td>6</td> <td>2</td> <td>10</td> <td>4</td> <td>8</td> </tr> <tr> <td>y</td> <td>9</td> <td>11</td> <td>5</td> <td>8</td> <td>7</td> </tr> </table>	x	6	2	10	4	8	y	9	11	5	8	7	
x	6	2	10	4	8									
y	9	11	5	8	7									
Q2(d)	Find the smallest positive root of equation $f(x) = x^3 - 9x + 1 = 0$ by bisection method, correct up to 4 decimal places.													
Q2(e)	Use Gauss -Seidel iterative method to solve the following system of simultaneous equations: $8x - 3y + 2z = 20$; $6x + 3y + 12z = 35$; $4x + 11y - z = 33$													

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q3(a)	Verify that function $f(z) = \frac{x^2y^5(x+iy)}{x^4+y^{10}}$, $z \neq 0$; $f(0) = 0$ is analytic or not?	
Q3(b)	State and prove Cauchy Integral formula.	

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q4(a)	Find the Fourier sine transform of $\frac{e^{-ax}}{x}$, $a > 0$. Hence find the Fourier sine transform of $\frac{1}{x}$	
Q4(b)	Find Z transform of $\frac{10z}{z^2 - 3z + 2}$.	

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)												
Q5(a)	Fit a poisson distribution to the following data and calculate theoretical frequencies <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Accident per shift</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> </tr> <tr> <td>Frequency</td> <td>192</td> <td>100</td> <td>24</td> <td>3</td> <td>1</td> </tr> </table>	Accident per shift	0	1	2	3	4	Frequency	192	100	24	3	1	
Accident per shift	0	1	2	3	4									
Frequency	192	100	24	3	1									



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Q5(b)	Samples of sizes 7 and 9 were taken from two normal populations with S.D. 3.5 and 5.2 the sample mean were found to be 20.3 and 18.6. Apply the test whether the means of two populations are the same at 5% level.
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SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)										
Q6(a)	Estimate from the following table the number of students who obtained marks between 10 and 15											
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Marks</td> <td style="width: 15%;">0-10</td> <td style="width: 15%;">10-20</td> <td style="width: 15%;">20-30</td> <td style="width: 15%;">30-40</td> </tr> <tr> <td>No of students</td> <td style="text-align: center;">9</td> <td style="text-align: center;">30</td> <td style="text-align: center;">35</td> <td style="text-align: center;">42</td> </tr> </table>	Marks	0-10	10-20	20-30	30-40	No of students	9	30	35	42	
	Marks	0-10	10-20	20-30	30-40							
No of students	9	30	35	42								
Q6(b)	Using Lagrange interpolation formula find the value of $y(9.5)$ from the following table											
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">x</td> <td style="width: 15%;">7</td> <td style="width: 15%;">8</td> <td style="width: 15%;">9</td> <td style="width: 15%;">10</td> </tr> <tr> <td>y</td> <td style="text-align: center;">3</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">9</td> </tr> </table>	x	7	8	9	10	y	3	1	1	9	
x	7	8	9	10								
y	3	1	1	9								

SECTION-C	Attempt ANY ONE following Question	Marks (1X10=10)
Q7(a)	Find $\int_0^6 \frac{e^x}{1+x} dx$ approximately using Simpson's 3/8 rule on integration.	
Q7(b)	Use picard's method to obtain y for $x=0.2$, given $\frac{dy}{dx} = x + y$ with initial condition $y = 1$ when $x = 0$.	