MST-2

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Sciences			
Program	B.Tech.(ECE,IT,ME)	**Semester**	Ist
Subject Code	BSC-104	**Subject Title**	Mathematics II
Mid Semester Test (MST) No.	2	**Subject Teachers**	Pragya Goyal, Dr Sandeep Kaur, Dr Gagandeep Kaur
Max. Marks	24	**Time Duration**	1 hour 30 minutes
Date of MST	20-12- 2022	**Roll Number**	

Note: All questions are compulsory.

Q. No.	Question	COs, RBT level	Marks
Q1	Evaluate $\int_0^2 \int_1^2 \int_0^{yz} xyz \, dx \, dy \, dz$. $\frac{15}{2}$	CO3,L2	2
Q2	Sketch the region of integration $\int_0^1 \int_x^{\sqrt{2-x^2}} f(x,y) \, dx \, dy$.	CO2, L3	2
Q3	Change the order of integration and hence evaluate $\int_0^1 \int_{x^2}^{2-x} xy \, dy \, dx$. $\frac{3}{8}$	CO3,L3	4
Q4	Find the area lying inside the circle $r = a\sin\theta$ and outside the cardiod $r = a(1-\cos\theta)$. $a^2\left[1-\frac{\pi}{4}\right]$ or $\left(\frac{-\pi a^2}{4}+a^2\right)$ or $\frac{a^2}{2}\left[2-\frac{\pi}{2}\right]$	CO3,L3, L5	4
Q5	Evaluate the following by changing to polar coordinates $\int_0^2 \int_0^{\sqrt{2x-x^2}} \frac{x}{\sqrt{x^2+y^2}} \, dy \, dx$. $\frac{a^2}{8}$	CO3,L5	4
Q6	Find the volume bounded by the cylinder $x^2+y^2=4$ and the planes $y+z=4$ and $z=0$. 16π	CO3,L5	8

Course Outcomes (CO)
Students will be able to

1	Understand and apply concepts of vector calculus, differential equations and calculus of complex functions to engineering problems.
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3	Apply the techniques of multiple integrals in engineering problems.
4	Evaluate integrals of vector point functions over line, surfaces and volumes.
5	Substantiate the ability to integrate knowledge and ideas of multivariable calculus to engineering problems.
6	Understand how to decompose the periodic functions in series of sine and cosine.

RBT Classification	**Lower Order Thinking Levels (LOTS)**			**Higher Order Thinking Levels (HOTS)**		
RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

tan θ = sec²θ

Rosh

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Science			
Program	B.Tech. (EEA,CEA)	**Semester**	2nd
Subject Code	BSC-104	**Subject Title**	Mathematics-II
Mid Semester Test (MST) No.	2	**Course Coordinator(s)**	Prof. Sukhminder Singh
Max. Marks	24	**Time Duration**	1 hour 30 minutes
Date of MST	22-5-2023	**Roll Number**	

Note: Attempt all questions.

Q.No.	Question	CO's, RBT level	Marks
Q1	Evaluate $\int_0^1\int_0^1\int_0^1 e^{x+y+z}\,dxdydz$.	CO3, L2,L3,L5	2
Q2	Find $grad(\phi)$ where $\phi = 3x^2y - y^3z^2$ at the point $(1,-2,-1)$.	CO1, L2,L3,L5	2
Q3	Find the area bounded by the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.	CO3, L2,L3,L5	4
Q4	If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + \frac{1}{2}\cot u = 0$.	CO1, L2, L3,L5	4
Q5	Show that the vector field defined by $\vec{F} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$ is irrotational. Also find scaler potential such that $\vec{F} = \vec{\nabla}\phi$.	CO1, L2,L3,L5	4
Q6	A rectangular box, open at the top is to have a capacity 32 c.c. Find the dimensions of the box requiring least material for its construction using Lagrange method .	CO1, L2,L3,L5	8

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RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

2×4

$\phi(x,y,z) = xy + 2yz + 2zx$

$\phi(x,y,z) \Rightarrow x.y.z - 32$

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Science			
Program	B.Tech. CEA	**Semester**	2nd
Subject Code	BSC-104	**Subject Title**	Mathematics-II
Mid Semester Test (MST) No.	1	**Course Coordinator(s)**	Prof. Sukhminder Singh, Dr. Gagandeep Kaur, Dr. Sandeep Chauhan
Max. Marks	24	**Time Duration**	1 hour 30 minutes
Date of MST	24-03-2023	**Roll Number**	

Note: Attempt all questions.

Q.No.	Question	CO's, RBT level	Marks
Q1	Evaluate $\int_0^1 \int_0^{1-x} e^{2x+3y}\,dydx$.	CO3, L2,L3	2
Q2	Write the Dirichlet's conditions for expansion of a function as Fourier series.	CO6, L2,L1	2
Q3	Find all the asymptotes of the curve $x^2y+xy^2+xy+y^2+3x=0$.	CO2, L2,L5	4
Q4	Find the half range sine series of function $f(x)=\begin{cases} x, 0<x<\frac{\pi}{2} \\ \pi-x, \frac{\pi}{2}<x<\pi \end{cases}$. $b_n = 0$	CO6, L2, L3,L5	4
Q5	Trace the curve: $r=a(1+\cos\theta)$	CO2, L2,L5	4
Q6	Find the Fourier series of the function $f(x)=x-x^2$. Also deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots\ldots\ldots\ldots\infty=\frac{\pi^2}{12}$. $(-\pi,\pi)$	CO6, L2,L3,L5	8

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RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

$14+8+2 = 24 \to 20$

MST-1

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Sciences			
Program	B.Tech.(ECE,IT,ME)	**Semester**	Ist
Subject Code	BSC-104	**Subject Title**	Mathematics II
Mid Semester Test (MST) No.	1	**Subject Teachers**	Pragya Goyal, Dr Sandeep Kaur, Dr Gagandeep Kaur
Max. Marks	24	**Time Duration**	1 hour 30 minutes
Date of MST	14th Nov 2022	**Roll Number**	

Note: All questions are compulsory.

Q. No.	Question	COs, RBT level	Marks
Q1	Write the function for square waveform. Why it is called so?	CO6,L2	2
Q2 Touch only	If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then evaluate $(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z})^2 u$	CO5,L3	2
Q3	Expand $e^x \log(1+y)$ in powers of x and y upto terms of third degree $y + xy - y^2/2 + x^2y/2 - xy^2/2 + y^3/3$	CO5,L3	4
Q4	If u = xlog(xy) where $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$.	CO5,L4	4
Q5	If $u = \tan^{-1}\frac{x^3 + y^3}{x - y}$, then evaluate $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\frac{\partial^2 u}{\partial y^2}$ → sin4u − sin2u	CO5,L5	4
Q6	Find Fourier series expansion of $f(x) = x - x^2, -\pi < x < \pi$ and hence show that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \ldots\ldots = \frac{\pi^2}{6}$ $a_0 = 0$, $a_n = -\frac{4(-1)^n}{n^2}$, $b_n = -\frac{2(-1)^n}{n}$	CO6,L5	8

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RBT Level Name	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

MST-1

Guru Nanak Dev Engineering College, Ludhiana			
Department of Applied Science			
Program	B.Tech.(CS A, CS B, CS C,IT A, IT B, EC A, EC B)	**Semester**	2nd
Subject Code	BSC-104	**Subject Title**	Mathematics II
Mid Semester Test (MST) No.	1	**Course Coordinator(s)**	Prof. Rajbir Kaur, Prof. Sukhminder Singh, Dr. Gagandeep Kaur
Max. Marks	24	**Time Duration**	1 hour 30 minutes
Date of MST	27th April,2022	**Roll Number**	

Note: Attempt all questions

Q. No.	Question	COs, RBT level	Marks
Q1	Write Euler's formula to calculate bn for any function f(x) in interval (-2,2). Also Evaluate b_n for $f(x)= x^2-x^4$ in (-2,2).	CO5, L1, L3	2
Q2	If $u = \log \sqrt{x^2 + y^2 + z^2}$, Prove that $(x^2 + y^2 + z^2)\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}\right) = 1.$	CO5, L3	2
Q3	(a) Define Periodic Function. Also Find the period of f(x) = cos3x . (b) If $u=f\left(\frac{x}{y},\frac{y}{z},\frac{z}{x}\right)$, $Prove\ that\ x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$	CO5,L1,L2 CO5,L5	2,2
Q4	Expand $f(x,y)= 21+x-20y-4x^2+xy+6y^2$ in Taylor's series of maximum order about the point (-1,2)	CO5, L3, L5	4
Q5	Using Lagrange's Method , find the shortest and the longest distance from the point (3,4,12) to the sphere $x^2+y^2+z^2=1$.	CO5, L2, L3	4
Q6	Find the Fourier series for $f(x) =\|\cos x\|$ in $(-\pi, \pi)$.	CO5, L5	8

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RBT Level Number	L1	L2	L3	L4	L5	L6
RBT Level	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating

Math-I Math 221

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: .....]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 1st/2nd
Name of Subject: Mathematics II
Subject Code: BSC-104
Paper ID: 15940

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Write the function for saw toothed wave form and justify its name.

b) Is there any difference between multiple pints or double points in a curve. Give reasons. Discuss two different types of double points.

c) If an error of 2% is made while measuring the sides of a square, find the error in calculating its area.

d) State Gauss's Divergence theorem.

e) Change the order of integration in the integral $\int_0^1 \int_{x^2}^{2-x} f(x)dydyx$, when it is given that the points of intersection of the two curves are (1,1) and (-2,4)

f) Give physical Interpretation of curl.

Part – B **[Marks: 04 each]**

Q2. Express $f(x) = |x|$, $-\pi < x < \pi$, as a Fourier series.

Q3. Define implicit function and hence find derivative of y w.r.t. x for the implicit function $x^3 + y^3 = 6xy$ using the method of partial differentiation

Q4. If $f(x)=\begin{cases} x, 0<x<\frac{\pi}{2} \\ \pi-x, \frac{\pi}{2}<x<\pi \end{cases}$, then find the half range sine series expansion

Q5. Evaluate $\iint r^2 dr d\theta$ over the area included between the circles r=2sinθ and r = 4sinθ

Q6. If $z = e^{ax+by} f(ax-by)$, then find the value of $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y}$

Q7. Find the value of $\nabla.\left\{r\nabla\left(\frac{1}{r^3}\right)\right\}$

Part – C **[Marks: 12 each]**

Q8. Trace the curve $\left(\frac{x}{a}\right)^{2/3}+\left(\frac{y}{b}\right)^{2/3}=1$ by discussing all its important points like symmetry, Origin, points of intersection with axes, asymptotes, tangents and region etc.

OR

The sum of three positive numbers is constant .Prove that their product is maximum when they are equal

Q9. Evaluate $\iiint z(x^2+y^2)dxdydz$; where V = {(x,y,z): $x^2+y^2 \le 1, 2 \le z \le 3$}

OR

Apply Green's theorem to evaluate $\oint_C [(2x^2-y^2)dx+(x^2+y^2)dy]$, where C is the circle $x^2+y^2=a^2$

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