Lagdu Singh Charitable Trust's (Regd.)
THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY
Autonomous College Affiliated to University of Mumbai
Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra(GoM)
Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. A.Y 2019-20
Amongst Top 200 Colleges in the Country, Ranked 195th in NIRF India Ranking 2019 in Engineering College category
• ISO 9001:2015 Certified • Programmes Accredited by National Board of Accreditation (NBA), New Delhi
• Institute Accredited by National Assessment and Accreditation Council (NAAC), Bangalore
Estd. in 2001

IN-SEMESTER EXAMINATION (ISE-I) April 2023

Mathematic II

Branch: COMP, CIVIL, CS&E, AI&DS, IOT, E&CS (Group 1)
Date : 03/04/2023
Division: A, B, C
Duration: 60 Minutes

Timing: 1:30 PM to 2:30 PM
Maximum Marks: 20

Instructions –

1. All questions are compulsory.
2. Assume suitable data wherever necessary and state the assumptions made.
3. Write proper question number with each answer.
4. Use of non-programmable calculators is permitted.
5. Figures to the right indicates full marks.

		Marks	CO	Learning Level
	Solve any 5 out of 7 questions (2 marks each).			
a.	Check wheather the given equation is exact or not $y(x^2y + e^x)dx - e^x dy = 0$	02	1	U
b.	Find the integrating factor of non-exact differential equation $\sin x\ dy + (xy\cos x - y\sin x - 2)dx = 0$	02	1	U
c.	A cup of coffee at 190^0 F is left in room of 70^0 F. At time t=0, the coffee is cooling at 15^0F per minute. Find the proportionality constant k in the model of cooling of coffee.	02	1	R
d.	Find particular integral of Differential equation $D^2y - 4y = 2\cosh(2x)$	02	2	U
e.	Solve $(D^2 + 2)y=0$	02	2	R
f.	If A= $\begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$, then find the Eigen values of $6A^{-1} + A^3 + 2I$.	02	3	U
g.	Find the Eigen values of the matrix $\begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$.	02	3	U
Q.2.	**Solve any 1 out of 2 questions (5 marks each).**			
a.	Solve the differential equation $(x^4 + y^4)dx - xy^3dy = 0$	05	1	A
	OR			
b.	Solve the differential equation $y\frac{dx}{dy} = x - yx^2 siny$	05	1	A
Q.3	**Solve any 1 out of 2 questions (5 marks each).**			
a.	Solve the differential equation $\frac{d^2y}{dx^2} + a^2y = \operatorname{cosec} ax$	05	2	A
	OR			
b.	Solve the differential equation $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 5y = x^2 \sin\log x$	05	2	A

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END SEMESTER EXAMINATION, JUNE 2023

F. E. /F.T. SEMESTER II (CBCGS-HME 2020)

Branch:	**COMP, CIVIL, E&CS, CSE, IOT, AI&DS**	**Q.P. Code:**	**E121G1002-1**
Subject:	**Mathematics-II**	**Duration:**	**2 hours**
Subject Code:	**BSC104**	**Max. Marks:**	**60**

Instructions:
1. **All sections are compulsory**
2. **Figures to the right indicate full marks.**
3. **Assume suitable data if necessary and state the assumptions clearly.**
4. **Diagrams / sketches should be given wherever necessary.**
5. **Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.**

	Section-I (10 Marks)				
	Short Answer question (Answer any 5)	**Marks**	**CO**	**RBT**	**PI**
1	Check wheather the given equation is exact or not $(2y^2 - 4x + 5)dx = (y - 2y^2 - 4xy)dy$	2	1	U	2.1.1
2	Find the particular-integral (P.I.) for the differential equation $(D^2 + 4)y = \cos 2x$	2	2	U	2.1.2
3	Find the product of eigen values of the matrix $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$	2	3	R	1.1.2
4	Evaluate $\int_0^1 \int_0^x (x^2 + y^2)\, x \; dydx$	2	4	U	2.2.2
5	Write down the limits of cylindrical polar coordinates for the volume bounded by the paraboloid $x^2 + y^2 = az$ and the plane z = a.	2	5	R	1.4.1
6	*Find the residue of* $f(z)$ *at the pole* $z = 1$ $\int_C \frac{z+2}{(z-1)(z-3)} dz$ *where C is the circle* $\lvert z \rvert = 2$	2	6	U	1.1.2

	Section-II (20 Marks)				
	Descriptive Answer question (Answer any 4)	**Marks**	**CO**	**RBT**	**PI**
1	The current i is a circuit containing an inductance L, resistance R and voltage $E \sin wt$ is given by $L\frac{di}{dt} + Ri = E\sin wt$ for t = 0, i = 0, Find i.	5	1	U	2.1.1
2	Solve by the method of variation parameters. $\frac{d^2y}{dx^2} + 4y = \tan 2x$	5	2	A	2.1.2
3	Compute $A^9 - 6A^8 + 10A^7 - 3A^6 + A + I$ where $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ by Cayley Hamilton theorem.	5	3	A	1.1.2
4	Evaluate $\iint_R xy\,dx\,dy$, over the region bounded by $x^2 = y, y^2 = -x$.	5	4	A	2.2.2
5	Show that $\int_0^1\int_0^{1-x}\int_0^{1-x-y} \frac{1}{(x+y+z+1)^3}\,dx\,dy\,dz = -\frac{1}{2}\left(\frac{5}{8} - \log 2\right)$	5	5	A	1.1.2
6	Evaluate $\int_C \frac{z+3}{z^2+2z+5}\,dz$, where C is the circle $\lvert Z + 1 - i\rvert = 2$	5	6	U	1.4.1
	Section-III (30 Marks)				
	Long Answer question (Answer any 3)	**Marks**	**CO**	**RBT**	**PI**
1	Evaluate $(xy\sin xy + \cos xy)ydx + (xy\sin xy - \cos xy)xdy = 0$	10	1	A	2.1.2
2	Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + 4y = \cos(\log x) + x\sin(\log x)$	10	2	A	1.1.2

3	Show that the matrix $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$ is diagonalizable. Also find the transforming matrix and the diagonal matrix.	10	3	AN	1.4.1
4	Change the order of integration and evaluate $\int_0^2 \int_{\sqrt{2y}}^2 \frac{x^2}{\sqrt{x^4 - 4y^2}} dx\,dy$	10	4	A	1.4.1
5	*Evaluate* $\iiint xyz(x^2 + y^2 + z^2)dxdydz,$ *over the first octant of the sphere* $x^2 + y^2 + z^2 = a^2$	10	5	A	2.1.2