BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: ……………………………………………. Roll No.: …………………………………………..

Branch: ……………………………………………. Signature of Invigilator: ……………………

Semester: IVth   Date: ………….……..

Subject with Code: MA207 MATHEMATICS IV

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE
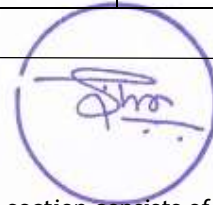
1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.

2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**

3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.

4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.

5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.

6. Write on both side of the leaf and use pens with same ink.

7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.

8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.

9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.

10. Always maintain the highest level of integrity. Remember you are a BITian.

11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

MA 207: Mathematics-IV, IMSC-IV, Physics, Chemistry , SP2022, End Sem Exam

Instructions: Attempt all questions Each question of section A contains 2 marks and each questions of section B contains 5 marks.   Time: 2 hour

Secion A

Q1

Wronskian of $\sin 2x$ and $\cos 2x$ is

(A) -2   (B) 2   (C) 0   (D) None

Q. 2
Particular Integral of $\frac{d^2 y}{dx^2} - 2\frac{dy}{dx} + y = x \sin x$

(A) $\frac{1}{2}x \cos x + \frac{1}{2}cos x - \frac{1}{2}$ (B) $\frac{1}{2} \sin x + \frac{1}{2} \cos x - \frac{1}{2}$

(C) $\frac{3}{2} \sin x + \frac{1}{2} \cos x - \frac{1}{2}$ (D) None

Q3.
Complementary Function of $x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$ is

(A) $C_1 x^{-1} + C_2 x^{-2}$ (B) $C_1 x^{-3} + C_2 x^{-2}$
(C) $C_1 x^{-1} + C_2 x^{-3}$ (D) None

Q4)

$J_{\frac{3}{2}}(x) =$

(A) $\sqrt{(\frac{2}{\pi x})}(\frac{\sin x}{x} - \cos x)$ (B) $\sqrt{(\frac{2}{\pi x})}(\frac{\cos x}{x} - \cos x)$
(C) $\sqrt{(\frac{2}{\pi x})}(\frac{\sin x}{x} - \sin x)$ (D) None

Q5) $5x^3 - 3x =$

(A) $2P_3 + P_1$ (B) $P_3 + 2P_1$ (C) $P_3 + P_1$ (D) None

Q6) $\int_{-1}^{1}[P_2(x)]^2 dx =$

(A) 2/3   (B) 3/2   (C)3/4   (D) None

Q7)

For fourier series expansion $f(x) = x + x^2$ for $-\pi < x < \pi$. Then a_n

(Corresponding to cos term) =

(A) $\frac{4(-1)^n}{n^2}$ (B) $\frac{2(-1)^n}{n^2}$ (C) $\frac{3(-1)^n}{n^2}$ (D) None

Q 8)
Solution of the differential equation $yq - xp = z$ is

(A) $f(xy, y/z) = 0$ (B) $f(xy, z/y) = 0$ (C) $f(zy, y/x) = 0$ (D) None

Q9) Solution of the differential equation $y^2p - xyq = x(z - 2y)$ is

(A) $f(x^2 + y^2, y^2 - yz) = 0$ (B) $f(x^2 + y^2, y^3 - yz) = 0$

(C) $f(x^3 + y^2, y^2 - yz) = 0$ (D) None

Q 10)
The function $f(z) = z|z|$ is (A) analytic everywhere (B) Not anylytic every where (C) Can not be concluded

Q11)

Value of $\int_c \frac{z+4}{z^2+2z+5} dz$; where C : is $|z + 1| = 1$

(A) 0   (B)2   (C) 3   (D) None

Q12)

$I = \int_C \frac{dz}{z^2-1} = $; where $C : x^2 + y^2 = 4$

(A) 0   (B) 2   (C)3   (D) None

Q13)

Residue of $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ at $z = -2$ is

(A) 4/9   (B) 5/9   (C) 1   (D) 0   (E) None

Q14)

If the function $f(z) = \frac{1}{(z-1)(z-2)}$ is expanded for $1 < |z| < 2$ then the constant term (no z in that term) for expansion is

(A) $-1/2$ (B) 1/2   (C) 3/2   (D) None

Q15)

Taylor series expansion of $f(z) = \frac{1}{(z-1)(z-3)}$ about the point $z = 4$. Coefficient of $z - 4$ is

(A) $-4/9$ (B) $4/9$ (C) $5/9$ (D) None.

Section B

Q1) Solve the differential equation $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x$
   Or
   Solve the differential equation $x^2\frac{d^2y}{dx^2} - 4x\frac{dy}{dx} + 6y = x^2$

Q2) Find a fourier series to represent $x - x^2$ in the interval $-\pi < x < \pi$

Or

Solve the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2\frac{\partial^2 y}{\partial x^2}$, such that $y = P_0 \cos pt$; P_0 is a constant when $x = l$ and $y = 0$ and $x = 0$; c is constant.

Q3) If $f(z) = u(x, y) + iv(x, y)$ be an analytic function. $u = 3x - 2xy$. Find v and express $f(z)$ in terms of z.

Q4) Evaluate $\int_C \frac{z-1}{(z+1)^2(z-2)}dz$ where $C : |z - i| = 2$.