

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: ISc
BRANCH: PHYSICS

SEMESTER: Third
SESSION: MO/2022

SUBJECT: PH213 MATHEMATICAL PHYSICS II

TIME: 2 HOURS

FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

		CO	BL
Q1 (a) Define linear, semi-linear and quasi-linear partial differential equations. What are Monge curves?	[2]	1	1
Q1 (b) Derive the Taylor and binomial series expansion formulae.	[3]	1	2
Q2 (a) Integrate the following equation using the method of integrating factor $y'(x) - \frac{2y}{x} = 3x^3$	[2]	1	3
Q2 (b) Prove the mean value property for harmonic functions.	[3]	1	2
Q3 (a) Define exact and inexact differentials with examples.	[2]	2	2
Q3 (b) Reduce the following differential equation to canonical form $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial x \partial y} - 2 \frac{\partial^2 u}{\partial y^2} + 1 = 0$	[3]	2	4
Q4 (a) Define tangent, principal normal and bi-normal to a curve.	[2]	2	1
Q4 (b) Find an equation or expression for the tangent plane to the surface $z = xy$ at the point $(2,3,6)$	[3]	2	3
Q5 (a) Show that if \vec{A} and \vec{B} are irrotational, $\vec{A} \times \vec{B}$ is solenoidal and if $f(r)$ is differentiable then $f(r) \vec{r}$ is irrotational.	[2]	3	4
Q5 (b) Prove $\nabla \times (\nabla \times \vec{A}) = -\nabla^2 \vec{A} + \nabla(\nabla \cdot \vec{A})$	[3]	3	4