

Internal Assessment

M.A./ M.SC. SEMESTER-I EXAMINATION,2019(CDOE,BU)

SUBJECT: MATHEMATICS(OLD)

Answer of MCG101 (Group A & B) together should be limited to one A4 size page,
Answer of MCG102 (Group A & B) together should be limited to one A4 size page,
Answer of MCG103 (Group A & B) together should be limited to one A4 size page,
Answer of MCG104 (Group A & B) together should be limited to one A4 size page,
Answer of MCG105 (Group A & B) together should be limited to one A4 size page.

Notation and symbols have their usual meaning.

TIME: 2 HOURS

FULL MARKS: 25

Paper :MCG101

(Group-A)
(Functional Analysis-I)

Answer any **one** question. Only **first** answer will be evaluated.

1×3 = 3

1. Show that in an inner product space X , every Cauchy sequence is bounded.
2. If T is an isomorphism of a linear space X onto another linear space W , then show that T has an inverse T^{-1} , which is an isomorphism of W onto X .

(Group-B)
(Real Analysis-I)

Answer any **one** question. Only **first** answer will be evaluated.

1×2 = 2

1. What do you mean by a function of bounded variation .
2. Evaluate the integral if exists $\int_0^1 x d(e^x)$.

Paper:MCG102

(Group-A)
(Linear Algebra)

Answer any **one** question. Only **first** answer will be evaluated.

1×3 = 3

1. Prove that an orthonormal set of vectors in a Euclidean space is linearly independent.
2. Determine the linear mapping $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ which maps the basis vectors $(1,0,0), (0,1,0), (0,0,1)$ of \mathbb{R}^3 to the vectors $(1,1), (2,3), (3,2)$ respectively. Find also $\text{Ker } T$. (2+1)

(Group-B)
(Modern Algebra-I)

Answer any one question. Only first answer will be evaluated.

1×2=2

1. Prove that every Boolean ring is of characteristic two.
2. Let \mathbb{R} be a commutative ring with 1. Prove that every maximal ideal of \mathbb{R} is a prime ideal of \mathbb{R} .

Paper:MCG103

(Group-A)
(Elements of General Topology)

Answer any one question. Only first answer will be evaluated.

1×3 = 3

1. Show that a second countable space is separable.
2. When is a topological space called T_0, T_1 ? Give an example of a T_0 space that is not a T_1 space. (2+1)

(Group-B)
(Complex Analysis-I)

Answer any one question. Only first answer will be evaluated.

1×2= 2

1. State Morera's theorem.
2. a) What do you mean by entire function?
b) State Liouville's theorem. (1+1)

Paper :MCG104

(Group-A)
(Ordinary Differential Equations and Special Functions)

Answer any one question. Only first answer will be evaluated.

1×3= 3

1. Show that $P_n(-z) = (-1)^n P_n(z)$.
2. Define a regular integral of a second order ordinary differential equation

$$\frac{d^2y}{dz^2} + p_1(z) \frac{dy}{dz} + p_2(z)y = 0$$

in a neighbourhood of a singular point z_0 .

(Group-B)
(Operations Research-I)

Answer any one question. Only first answer will be evaluated.

1×2= 2

1. State fundamental theorem of L.P.P.
2. How are incoming and outgoing vectors selected in the bounded variable technique for solving L.P.P. ?

Paper :MCG105

(Group-A) (Principle of Mechanics-I)

Answer any **one** question.Only **first** answer will be evaluated.

1×3= 3

1. What do you mean by cyclic coordinates? Show that, the generalized momentum conjugate to a cyclic coordinate is a constant of motion. (1+2)
2. Define Canonical transformation. Give an example of a phase-space transformation which is not canonical . (2+1)

(Group-B) (Numerical Analysis)

Answer any **one** question.Only **first** answer will be evaluated.

1×2= 2

1. Define the Tchebychev's polynomial of degree n over the interval $[-1,1]$.
What are its extreme values ? (1+1)
2. Obtain an expression for the error in Gaussian quadrature formula.