Progressive Education Society's

Modern College of Arts, Science & Commerce Ganeshkhind, Pune – 16 (Autonomous)

End Semester Examination: OCT / NOV 2024

***Total No. of Questions**: 5 / 26* ***Total No. of Pages**: 2*

FIRST YEAR (F.Y.B.Sc Blended)
24BLMT11301: Calculus
(Semester I)

Program: B.Sc Blended **Credits: 4**
Program Specific: B.Sc Blended Chemistry **Time:** 3 Hours
Course Type: Open Elective **Max. Marks: 60**
Paper: IV **SET: A**

Instructions to the candidate:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Draw a well labelled diagram wherever necessary.*

Q1) Attempt **ANY SIX** of the following: **[6 X 2 = 12]**

a) Let set A={a, b} and set B={2, 4} then find the Cartesian product AxB
b) Find the derivative of a function y=sinx.w.r.t x
c) Construct the truth table for the statement $\sim p \vee q$
d) Integrate the function y=$x^3 + 3x$
e) Define a function, its domain and range.
f) Write the symbolic form of the statement "If it snows tonight then I will stay at home."
g) For the set A={1, 2, 3, 4, 5} and B={2, 4, 6, 8} find A∪ B.
h) State the D'Alembert's Ratio test

Q2) Attempt **ANY TWO** of the following: **[3 X 2 = 6]**

a) Let P(x) denotes the statement 'x>3'. What are truth values of P(4) and P(2)?
b) Define Constant function and Identity function. Give the example for the same.
c) Let Q(x) : "x=x+1" What is the truth value of quantification $\exists x\ Q(x)$, where domain is $\mathbb{R}$.
d) State the D'Alembert's Ratio test

Q3) Attempt **ANY THREE** of the following: **[3 X 4 = 12]**

a) Show that the function $f: \mathbb{R} \to \mathbb{R}, f(x) = 2x + 3$ is bijective.
b) Integrate the function by parts $\int x^2 cosx\ dx$.
c) Differentiate the function y=$\frac{logx}{1+x^2}$ with respect to x.
d) Integrate the function $y = x^3 + 3x + 5$ with respect to x.
e) Verify Rolle's theorem for the function f(x)=2+$(x-1)^{\frac{2}{3}}$, x∈ $[0, 2]$

4) Attempt **ANY THREE** of the following: **[3 X 4 = 12]**

a) State and prove division property (with respect to addition and product) of Natural Numbers and Integers

b) Check whether the statement is Tautology, Contradiction or Contingency

$$(p \vee q) \rightarrow (p \wedge q)$$

c) Write the symbolic form of the statement and write its converse, inverse and contrapositive. " If it rains today then I will bring an Umbrella."

d) If A= {a,b,c}. Write relation R=AxA and check whether R is an equivalence relation or not. Also write the matrix of the relation R.

e) Differentiate the function y=$\frac{e^x}{1+x^2}$ with respect to x.

Q5) Attempt **ANY THREE** of the following: **[3 X 6 = 18]**

a) Prove that $p \leftrightarrow q \equiv (p \rightarrow q) \Lambda (q \rightarrow p)$ Using truth table.

b) Let f**:** $\mathbb{R} \rightarrow \mathbb{R}$ and g: $\mathbb{R} \rightarrow \mathbb{R}$ be defined by f(x) = 3x-2 and g(x)= x^2 + 4. Find formulas which defines the functions (gof) and (fog).

c) State and prove Distributive law.

d) Let X= {-2, -1,0,1,2} and let function f**:** X $\rightarrow \mathbb{R}$ be defined by the formula f(x)=$x^2 + 1$.Find the range of f.

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