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Total No. of Pages: 03

Total No. of Questions: 09

B.Sc. (Agriculture) (2014 & Onwards) (Sem.– 2)

MATHEMATICS – II

M Code: 72360

Subject Code: BSAG-205A

Paper ID: [72360]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTIONS TO CANDIDATES:

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION A

1. a) Find $f \circ g \circ h$ if $f(x) = \sqrt{x-1}$, $g(x) = x^2 + 2$ and $h(x) = x + 3$.
b) Prove that $\lim_{x \rightarrow 0} x^2 \sin \frac{1}{x} = 0$.
c) The position of a particle is given by the equation of motion $s = f(t) = \frac{1}{(1+t)}$ where t is measured in seconds and s in meters. Find the velocity and the speed after 2 seconds.
d) If $y = a \cosh \left(\frac{x}{a}\right)$ prove that $a^2 y_2^2 = 1 + y_1^2$.
e) If $f(x) = \sqrt{x-1}$, find the derivative of f . State the domain of f' .
f) Evaluate $\int_1^9 \frac{2t^2 + t^2 \sqrt{t} - 1}{t^2} dt$.
g) Evaluate the indefinite integral of $\int \cot x \, dx$.
h) Evaluate $\int \frac{x}{\sqrt{1-4x^2}} dx$.
i) Find $\int \log x \, dx$.
j) Find $\int \frac{1}{(t+4)(t-1)} dt$.

SECTION B

2. Find the horizontal asymptotes of the graph of the function

$$f(x) = \frac{x-9}{\sqrt{4x^2 + 3x + 2}}$$

3. The population P (in thousands) of Belgium from 1992 to 2000 is shown in the table. (Midyear estimate are given)

Year	1992	1994	1996	1998	2000
P	10,036	10,109	10,152	10,175	10,186

- a) Find the average rate of growth
- from 1992 to 1996
 - from 1994 to 1996, in each case include the units.
- b) Estimate the instantaneous rate of growth in 1996 by taking the average of two average rates of change. What are its units?
- c) Estimate the instantaneous rate of growth in 1996 by measuring the slope of tangent.

4. If $x = \sin t$, $y = \sin pt$, prove that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + p^2y = 0$.

5. Using the method of substitution, evaluate $\int e^{\sin\theta} \cos\theta d\theta$.

6. Prove the reduction formula $\int \cos^n x dx = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} \int \cos^{n-2} x dx$.

SECTION C

7. a) Evaluate $\int \frac{x^4 - 2x^2 + 4x + 1}{x^3 - x^2 - x + 1} dx$

b) Find the n^{th} derivative of $\log_{10} \sqrt{\frac{(3x+5)^2(2-3x)}{(x+1)^2}}$.

8. First make substitution and then use integration by parts to evaluate the integral

$$\int_{\sqrt{\pi/2}}^{\sqrt{\pi}} \theta^3 \cos(\theta^2) d\theta$$

9. If $u = f\left(\frac{x}{y}\right) + \sqrt{x^2 + y^2}$ prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sqrt{x^2 + y^2}$.