

Sample Question Paper

Program Name : Civil Engineering Program Group
Program Code : CE/CR/CS
Semester : Second
Course Title : Applied Mathematics
Max. Marks : 70

22201

Time: 3 Hrs.

Instructions:

1. All Questions are Compulsory.
 2. Answer each next main Question on a new page.
 3. Illustrate your answers with neat sketches wherever necessary.
 4. Non Programmable pocket calculator is allowed.
 5. Programmable pocket calculator is not allowed.
 6. Figures to the right indicate full marks.
 7. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
-
-

Q.1 Attempt any FIVE of the following

10 Marks

- a) Define Parametric Function with suitable example.
- b) If $f(x) = x^3 + x^2 - 2$, find $f(1) - f(2)$.
- c) Find $\frac{dy}{dx}$ if $y = x \cdot \tan x$
- d) Evaluate $\int x \cdot e^x dx$
- e) Evaluate $\int \frac{1}{1 + \cos 2x} dx$
- f) Find the area bounded by the curve $y = 3x^2$, X-axis & the ordinates $x = 1$, $x = 3$.
- g) State the Trapezoidal rule of numerical integration.

Q.2 Attempt any THREE of the following

12 Marks

- a) Find $\frac{dy}{dx}$ if $x^3 + y^3 = 3axy$
- b) If $x = a(\cos t + t \cdot \sin t)$ and $y = a(\sin t - t \cdot \cos t)$. Find $\frac{dy}{dx}$ at $t = \frac{\pi}{4}$
- c) The bending moment of a beam supported at the ends and uniformly loaded at a distance x from one end is given by $M = \frac{WL}{2} x - \frac{W}{2} x^2$ where W is the load of the beam per unit run. Find a point on the beam at which the bending moment is maximum.

- d) A beam is bent in the form of the curve $y = 2 \sin x - \sin 2x$. Find the radius of curvature at $x = \frac{\pi}{2}$.

Q.3 Attempt any THREE of the following

12 Marks

- a) Find the equation of the tangent and normal to the curve $2x^2 - xy + 3y^2 = 18$ at the point (3, 1).
- b) Find $\frac{dy}{dx}$ if $y = x^{\tan x} + (\tan x)^x$
- c) If $y = \log(\operatorname{cosec} x - \cot x)$ find $\frac{dy}{dx}$
- d) Evaluate $\int \frac{(\tan^{-1} x)^3}{1 + x^2} dx$

Q.4 Attempt any THREE of the following

12 Marks

- a) Evaluate $\int \frac{dx}{\sqrt{1 + x - x^2}}$
- b) Evaluate $\int \frac{dx}{12\cos x - 5\sin x + 13}$
- c) Evaluate $\int x \cdot \log(1 + x) dx$
- d) Evaluate $\int \frac{\cos x dx}{(2 + \sin x)(3 + \sin x)}$
- e) Evaluate $\int_0^{\pi/2} \frac{dx}{1 + \sqrt{\cot x}}$

Q.5 Attempt any TWO of the following

12 Marks

- a) Find the area between the parabola $y = x^2$ and the line $y = x$.
- b) Attempt the following:
- i) Form the differential equation from the relation $y = A \sin mx + B \cos mx$ where A & B are arbitrary constants & m being an integer.
- ii) Solve: $(y + x^2y) \frac{dy}{dx} - (3x + xy^2) = 0$
- c) An equation relating to the theory of stability of an airplane is given by the equation $\frac{dv}{dt} = g \cdot \cos \alpha - kv$ where v is the velocity; g & k being constant. Find an expression for the velocity if $v = 0$, when $t = 0$.

Q.6 Attempt any TWO of the following**12 Marks**

a) Attempt the following:

i) Using Trapezoidal rule, calculate the approximate value of $\int_0^4 \sqrt{x} \, dx$ given by

x	0	1	2	3	4
$y = \sqrt{x}$	0	1	1.4142	1.7321	2

ii) Using Simpson's one-third rule evaluate $\int_1^5 y \, dx$ using the following table

x	1	2	3	4	5
y	10	50	70	80	100

b) Using Simpson's $\frac{3}{8}$ th rule to find $\int_0^{0.6} e^{-x^2} \, dx$ by taking seven ordinates.c) Using Simpson's $\frac{1}{3}$ rd rule find the area under the curve $y = \sin x$ from $x = 0$ to $x = \pi$ taking $\frac{\pi}{6}$ as the common width of the strip. Compare the result with the exact area.

Scheme - I

Sample Test Paper - I

(40% of 5-Unit curriculum and 50% of 6-Unit curriculum)

Program Name : Civil Engineering Program Group

Program Code : CE/CR/CS

Semester : Second

Course Title : Applied Mathematics

Max. Marks : 20

22201

Time: 1 hour

Instructions:

1. All Questions are Compulsory.
 2. Answer each next main Question on a new page.
 3. Illustrate your answers with neat sketches wherever necessary.
 4. Non Programmable pocket calculator is allowed.
 5. Figures to the right indicate full marks.
 6. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
-

Q.1 Attempt any **FOUR** of the following

08 Marks

- a) If $f(x) = x^2 + 6x + 10$ find $f(0) + f(2)$.
- b) State whether the function $f(x) = \frac{x^3}{1 + x^2}$ is even or odd.
- c) Find $\frac{dy}{dx}$ if $y = \frac{x^2 + 1}{x^2 - 1}$
- d) Find $\frac{dy}{dx}$ if $y = e^{2x}(x^3 + 4)$
- e) Calculate the point of the curve $y = \log x$, when the slope is 1.
- f) Evaluate: $\int x(x - 2)^2 dx$

Q.2 Attempt any **THREE** of the following

12 Marks

- a) Find $\frac{dy}{dx}$ if $y = (\tan x)^{\sin x}$
- b) Find the equation of tangent and normal to the curve $y = 4x \cdot e^x$ at origin.
- c) A metal wire 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.
- d) Evaluate : $\int \left\{ \frac{1}{1 + x^2} - \frac{\cos x}{\sin^2 x} \right\} dx$

Scheme - I

Sample Test Paper – II

(60% of 5-Unit curriculum and 50% of 6-Unit curriculum)

Program Name : Civil Engineering Program Group

Program Code : CE/CR/CS

Semester : Second

Course Title : Applied Mathematics

Max. Marks : 20

22201

Time: 1 hour

Instructions:

1. All Questions are Compulsory.
 2. Answer each next main Question on a new page.
 3. Illustrate your answers with neat sketches wherever necessary.
 4. Non Programmable pocket calculator is allowed.
 5. Figures to the right indicate full marks.
 6. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
-

Q.1 Attempt any **FOUR** of the following.

08 Marks

a) Evaluate: $\int \frac{8 \sin^{-1} x}{\sqrt{1-x^2}} dx$

b) Evaluate: $\int \frac{1}{(x-1)(x+3)} dx$

c) Evaluate: $\int_0^1 \frac{dx}{\sqrt{1-x^2}}$

d) Find the area bounded by the curve $y = x^3$, X-axis & the ordinates $x = 1$, $x = 3$.

e) Find the order & degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^{4/3} = \left(y + \frac{dy}{dx}\right)^{3/2}$

f) State the Simpson's $\frac{3}{8}$ th rule of numerical integration

Q.2 Attempt any **THREE** of the following.

12 Marks

a) Evaluate: $\int_0^{\pi/2} \frac{dx}{1 + \sqrt{\tan x}}$

b) Solve: $x \frac{dy}{dx} - y = x^3$

c) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by Trapezoidal rule taking $n = 4$. Hence obtain the approximate value of π .

d) Find the approximate volume of a log of wood 4.8 m long from the following measurements, using Simpson's $\frac{1}{3}$ rd rule.

Distance	0	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8
Area	0.915	0.875	0.870	0.810	0.800	0.770	0.750	0.730	0.700