Scheme - I

Sample Question Paper

Program Name	: Mechanical and Chemical Engineering Program Group
Program Code	: AE, CH, FG, ME, PT, PG
Semester	: Second
Course Title	: Applied Mathematics
Max. Marks	: 70

22206

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 <u>FIVE</u> of the following   **10 Marks**

a) Define Even and Odd Functions.

b) If $f(x) = x^3 - 3x^2 + 5,$ find $f(0) + f(3)$.

c) Find $\frac{dy}{dx}$ if $y = x^{10} + 10^x + e^x$

d) Evaluate $\int x \cdot \sin x \, dx$

e) Evaluate $\int \frac{1}{1 - \cos 2x} \, dx$

f) Find the area bounded by the curve $y = x^2$, X-axis & the ordinates $x = 1, \ x = 3$.

g) If the coin is tossed three times. Find the probability of getting exactly two tails

Q.2 Attempt any <u>THREE</u> of the following   **12 Marks**

a) Find $\frac{dy}{dx}$ if $x \cos y + y \cos x = 0$

b) If $x = a \cos^3 \theta$ and $y = b \sin^3 \theta$. Find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$

c) The horse power transmitted by belt is given by $P = \frac{k}{550} \left\{ Tv - \frac{wv^2}{g} \right\}$. Find the speed v at which P is greatest. Also, find the greatest value of P for given values of k, T, w, g.

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 tangent & normal to the curve $x^2 + 3xy + y^2 = 5$ at the point (1, 1).

b) Find $\frac{dy}{dx}$ if $y = x^x$

c) If $y = \log\left(\sqrt{\frac{1+x}{1-x}} \right)$ 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 $\int \frac{e^x (x+1)}{\cos^2(x \cdot e^x)} dx$

b) Evaluate $\int \frac{dx}{4 - 5\cos x}$

c) Evaluate $\int x \cdot \tan^{-1}x \, dx$

d) Evaluate $\int \frac{\cos x \, dx}{(2 + \sin x)(3 + \sin x)}$

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

Q.5 Attempt any TWO of the following   **12 Marks**

a) Find the area bounded by the curve $y = 4 - x^2$ and the X – axis.

b) Attempt the following:

i) Form the differential equation by eliminating the arbitrary constants if
$y = A e^{2x} + B e^{-2x}$

ii) Solve:: $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ if $y = \pi/4$ when $x = \pi/4$

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) Assuming that 2 in 10 industrial accidents are due to fatigue. Find the probability that exactly 2 out of 8 accidents will be due to fatigue.

ii) On an average 3 of 10 electric components in a packet are defective. If 4 items are selected at random and tested, what is the probability that not more than one defective?

b) The no. of road accidents met with by taxi drivers follow Poisson distribution with mean 2. Out of 5000 taxis in the city, find the number of drivers.

i) Who does not met with the accident

ii) Who met with an accident more than 3 times?   Given: $e^{-2} = 0.1353$

c) A factory manufactured 2000 electric bulbs with average life of 2040 hours and standard deviation of 60 hours. Assuming normal distribution find the number of bulbs having life

i) More than 2150 hours.

ii) Less than 1960 hours.

Given that: A(1.83)= 0.4667 ; A(1.33)= 0.4082

Scheme - I

Sample Test Paper - I

Program Name	**: Mechanical and Chemical Engineering Program Group**
Program Code	**: AE, CH, FG, ME, PT, PG**
Semester	**: Second**
Course Title	**: Applied Mathematics**
Max. Marks	**: 20**

$$\boxed{\textbf{22206}}$$

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.
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5. Figures to the right indicate full marks.
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Q.1 Attempt any <u>FOUR</u> of the following   **08 Marks**

    a)   If $f(x) = x^2 + x + 10$ find $f(1) + f(2)$.

    b)   State whether the function $f(x) = \dfrac{x^3}{1 + x^2}$ is even or odd.

    c)   Find $\dfrac{dy}{dx}$ if $y = \dfrac{x^2 + 1}{x^2 - 1}$

    d)   Find $\dfrac{dy}{dx}$ if $y = (x^3 - 7x^2 + 3) \cdot (x^3 - 1)$

    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 <u>THREE</u> of the following   **12 Marks**

    a)   Find $\dfrac{dy}{dx}$ if $y = (\sinn x)^{\sin x}$

    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 : $\int \left\{ \dfrac{2}{1 + x^2} - \dfrac{\cos x}{\sin^2 x} \right\} \; dx$

Scheme - I

Sample Test Paper - II

<mark>(60% of 5-Unit curriculum and 50% of 6-Unit curriculum)</mark>

Program Name	**: Mechanical and Chemical Engineering Program Group**
Program Code	**: AE, CH, FG, ME, PT**
Semester	**: Second**
Course Title	**: Applied Mathematics**
Max. Marks	**: 20**

$$\boxed{\textbf{22206}}$$

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 <u>FOUR</u> of the following .   **08 Marks**

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

b) Evaluate: $\int \dfrac{1}{(x-1)(x-2)}\ dx$

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

d) Find the area bounded by the curve $y = 2x$, X-axis & the ordinates $x = 1,\ x = 3$.

e) Find the order & degree of the differential equation $\left(\dfrac{d^2y}{dx^2}\right)^{1/3} = \left(1 + \dfrac{dy}{dx}\right)^{3/2}$

f) Six dice are thrown 729 times. How many do you expect that at least three dice to show 5 or 6?

Q.2 Attempt any <u>THREE</u> of the following.   **12 Marks**

a) Evaluate: $\displaystyle\int_0^{\pi/2} \dfrac{\sqrt{\tan x}\ dx}{\sqrt{\tan x}+\sqrt{\cot x}}$

b) Solve: $x\dfrac{dy}{dx} - y\ = x^2$

c) A manufacture knows that the condensers he makes contain on the average 1% of defective. He packs them in boxes of 100. What is the probability that a box picked at random will contain 3 or more faulty condensers? ($e^{-1} = 0.36788$)

d) Hundred grinding machine are set so that its production shafts have an average diameter 10.10 cm and a standard deviation of 0.20 cm. Find the number of grinding machines having product specifications for shaft diameters are between 10.05cm and 10.20cm.

Given: A(0.25)= 0.0987 ; A(0.5)= 0.1915