

Scheme – G

Sample Test Paper-I

Course Name: All Branches of Diploma in Engineering and Technology

Course Code: AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/

IS/ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI

Semester : Third

Subject Title : Applied Mathematics

Marks : 25

17301

Time: 1 Hour

Instructions:

1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

Q.1 Attempt any THREE of the following.

(3x3=9)

- a. Find the area of circle $x^2+y^2=a^2$ by integration.
- b. State the order and degree of the differential equation

$$\frac{[1+(\frac{dy}{dx})^2]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}} = r$$

- c. From 20 tickets marked 1 to 20, one ticket is drawn at random. Find the probability that it is marked with multiple of 3 or 5.
- d. If a random variable has a Poisson distribution such that $P(2)=P(3)$, find $P(5)$.

Q.2 Attempt any TWO of the following.

(2x4=8)

- a. find the area bounded by the curve $y=x^2$ & the line $y=x$
- b. Solve: $(2xy+y-\tan y)dx+(x^2-x\tan^2 y+\sec^2 y)dy=0$
- c. If $P(A)=2/3$, $P(B')=3/4$ & $P(A/B)=4/5$ find $P(A \cap B)$ & $P(A/B)$

or

- c. If 20% of the bolts produce by a machine are defective. Determine the probability that out of 4 bolts drawn,
 - (i). one is defective
 - (ii). At the most two are defectives

Q.3 Attempt any TWO of the following.

(2x4=8)

a. solve: $(x + 1) \frac{dy}{dx} - y = e^x(x + 1)^2$

b. A husband and wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $1/7$ & that of wife's selection is $1/5$. What is the probability that

(i). both of them will be selected (ii). Only one of them will be selected and (iii). None of them will be selected

or

b. solve: $\frac{dy}{dx} = e^{2x-3y} + 4x^2e^{-3y}$

c. In a sample of 1000 cases, the mean of a certain test is 14 & standard deviation is 2.5.

Assuming the distribution to be normal, find

(i). how many students score between 12 & 15?

(ii). how many score above 18?

or

c. An urn contains 10 red, 5 white & 5 black balls. Two balls are drawn at random. Find the probability that they are not of the same colour.

Scheme – G

Sample Question Paper-II

Course Name: All Branches of Diploma in Engineering and Technology

Course Code: AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/

IS/ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI

Semester : Third

Subject Title : Applied Mathematics

Marks : 100

17301

Time: 3 Hours

Instructions:

1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

Q.1 Attempt any TEN of the following

(10x2=20)

- a. Find the point on the curve $y=7x-3x^2$ where the inclination of the tangent is 45°
- b. Find the radius of curvature of the curve $y=x^3$ at (2,8)
- c. Evaluate: $\int \frac{\sin(\log x)}{x} dx$
- d. Integrate w. r. t. x, $\frac{\sin^2 x}{1+\cos x}$
- e. Evaluate: $\int \log x dx$
- f. Evaluate: $\int \frac{1}{(x+1)(x+2)} dx$
- g. Evaluate: $\int_0^\infty e^{-x} dx$
- h. Find the area enclosed by curve $y=3x^2$ and the line $x=1$, $x=3$ & x-axis.
- i. Find order and degree of the following differential equation:

$$\frac{d^3 y}{dx^3} = \left[k + \left(\frac{dy}{dx} \right)^2 \right]^{3/2}$$

- j. Verify that $y=\log x$ is a solution of $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = 0$
- k. An urn contains 10 black and 10 white balls. Find the probability of drawing two balls of the same colour.
- l. An unbiased coin is tossed 6 times. Find the probability of getting 2 heads.

Q.2 Attempt any FOUR of the following**(4x4=16)**

- a. Find the equation of the tangent & normal to the curve $x^2 + 3xy + y^2 = 5$ at (1,1)
- b. A telegraph wire hangs in the form of a curve $y = a \log \left[\sec \left(\frac{x}{a} \right) \right]$ where 'a' is constant.

Show that the curvature at any point is $\frac{1}{a} \cos \left(\frac{x}{a} \right)$

- c. Find maxima and minima of $y = 2x^3 - 3x^2 - 36x + 10$

d. Evaluate: $\int \frac{1}{1 + \sin x} dx$

e. Evaluate: $\int \frac{\sec x \operatorname{cosec} x}{(\tan x)} dx$

f. Evaluate: $\int \frac{x^2 + 6x - 8}{x^3 - 4x} dx$

Q.3 Attempt any FOUR of the following**(4x4=16)**

a. Evaluate: $\int_0^\infty \frac{dx}{a^2 + b^2 x^2}$

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

- c. Find area bounded by the two curves $y^2 = 4x$ and $x^2 = 4y$

d. solve, $\frac{dy}{dx} = (4x + y + 1)^2$

e. solve $(x^2 + y^2)dx - 2xydy = 0$

f. Solve: $x \log x \frac{dy}{dx} + y = 2 \log x$

Q.4 Attempt any FOUR of the following**(4x4=16)**

a. Evaluate: $\int_3^5 \frac{\sqrt{8-x}}{\sqrt{8-x} + \sqrt{x}} dx$

b. Evaluate: $\int_0^\pi x \cdot \sin x \cdot \cos^2 x dx$

- c. Find area of the loop of a curve $y^2 = x^2(1 - x)$

d. Solve: $\frac{dy}{dx} = 1 + x + y + xy$

e. Solve: $(y \cdot e^{xy} - 2y^3)dx + (x e^{xy} - 6xy^2 - 2y)dy = 0$

f. Show that $y^2 = ax^2$ is a solution of $x \left(\frac{dy}{dx} \right)^2 - 2y \frac{dy}{dx} + ax = 0$

Q.5 Attempt any FOUR of the following**(4x4=16)**

- a. Three machines I, II and III manufactures respectively 0.4, 0.5 and 0.1 of the total production. The percentage of defective items produced by I, II and III is 2, 4 and 1 percent respectively. For an item chosen at random, what is the probability it is defective?

b. If 10% of bolts produced by a machine are defective. Determine the probability that out of 10 bolts chosen at random

i) one ii) none iii) at most 2 bolts will be defective.

c. Fit a Poisson distribution to set of observations:

X	1	2	3	4	5
f	122	60	15	02	01

d. Evaluate: $\int \frac{dx}{5+4\cos x}$

e. Evaluate: $\int_0^{\pi/4} x \cdot \sec^2 x dx$

f. Solve: $\cos^2 x (x - 2y) = 1 - 2 \frac{dy}{dx}$

Q.6 Attempt any FOUR of the following

(4x4=16)

a. If $P(A)=2/3$, $P(B')=3/4$ & $P(A/B)=4/5$ find $P(A \cap B)$ & $P(B/A)$.

b. If the probability of a bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction. (Given $e^2 = 7.4$)

c. A sample of 100 dry battery cells tested to find the length of life produced the following results. Assuming that the data are normally distributed what percentage of battery cells are expressed to have life i) more than 15 hrs. ii) less than 6 hrs. iii) between 10 hrs and 14 hrs.

d. A metal 36 cm long is bent to form a rectangle. Find its dimensions when its area is maximum.

e. find the equation of the tangent to the curve $y = 9x^2 - 12x + 7$ which is parallel to the x-axis.

f. Two points A(1,4) and B(9,12) are on the parabola $y^2 = 16x$. Show that area enclosed between the chord AB & the parabola is $16/3$
