

Question bank

Applied mathematics

Unit test – I

Q 1. Evaluate the following:

1. $\int \frac{\tan(\log x)}{x} dx$

2. $\int \frac{\sin \sqrt{x}}{\sqrt{x}} dx$

3. $\int \frac{e^{x(1+x)}}{\operatorname{cosec}(x e^x)} dx$

4. $\int \cos^3 4x dx$

5. $\int \tan^2 3x dx$

6. $\int \frac{\cos x}{7 - \sin^2 x} dx$

7. $\int \frac{1}{3x^2 - 5x + 4} dx$

8. $\int \frac{1}{2 \cos^2 x - 3 \sin^2 x} dx$

9. $\int \frac{1}{3 - 4 \sin x} dx$

10. $\int \frac{1}{5 - 3 \cos x} dx$

11. $\int \frac{3x+2}{x^2-5x+1} dx$

12. $\int \frac{1}{\sqrt{3} \cos x - \sin x} dx$

13. $\int \log x dx$

14. $\int \tan^{-1} x dx$

15. $\int \cos^{-1} x dx$

16. $\int x \tan^{-1} x dx$

17. $\int \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$

18. $\int e^{3x} \cos 2x dx$

19. $\int x^2 \sin x dx$

20. $\int \frac{\cos x}{(1 - \sin x)(2 - \sin x)} dx$

21. $\int \frac{x^2 + 3x}{(x-1)(x-2)^2} dx$

22. $\int \frac{4x^2 - x}{(x+1)(x^2+2)} dx$

23. $\int_0^1 x e^x dx$

24. $\int_0^x \sin^3 x \, dx$

25. $\int_0^1 \sin^{-1} x \, dx$

26. $\int_0^{\pi/2} \frac{\sqrt[3]{\cos x}}{\sqrt[3]{\sin x} + \sqrt[3]{\cos x}} \, dx$

27. $\int_0^{\pi/2} \frac{1}{1 + \cot x} \, dx$

28. $\int_2^5 \frac{\sqrt{7-x}}{\sqrt{x} + \sqrt{7-x}} \, dx$

29. $\int_0^{\pi/4} \log(1 + \tan x) \, dx$

30. $\int_0^1 \frac{x \sin x}{1 + \cos^2 x} \, dx$

Application of Integration

Q 1. Find the area bounded by the curve $y = 3x - 2$ from $x = 1$ to $x = 3$. ---- (3M)

Q 2. Find the area bounded by the parabola $y = x^2 - 2x$ with x - axis. ---- (3M)

Q 3. Find the area bounded under the curve $y = x^3 - 5x^2 + 4x$ from $x = 0$ to $x = 3$. ---- (3M)

Q 4. Find the area bounded by the parabola $y^2 = 4ax$ with its latus-rectum.---(3M)

Q 5. Find the area of the circle $x^2 + y^2 = 25$ using integration. ---- (4M)

Q 6. Find the area of the ellipse $9x^2 + 4y^2 = 36$ using integration. ---- (4M)

Q 7. Find the area bounded by the parabola $y^2 = 4x$ and the line $2x - y = 4$. -(4M)

Q 8. Find the area of the circle $y^2 - 2x = 0$ and $y^2 + 4x - 12 = 0$. ---- (4M)

Q 9. Find the area between the curves $y = \sin x$ and $y = \cos x$ for $[0, 90^0]$. --(4M)

Differential Equations

Q 10. Find the order and degree of

i) $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^3}$ ii) $x^2 \left(\frac{d^2y}{dx^2}\right)^2 + y \left(\frac{dy}{dx}\right)^3 + y^2 = 0$ ---- (3M Each)

Q 11. Form a differential equation by eliminating constants from

i) $xy = a^2$ ii) $y^2 = 4ax$. ---- (3M Each)

Q 12. Solve $\sec^2 x \cdot \tan y \, dx + \sec^2 y \cdot \tan x \, dy = 0$. ---- (3M)

Q 13. Solve $\frac{dy}{dx} = e^{3x-2y} + x^2 \cdot e^{-2y}$ ---- (3M)

Q 14. Solve $xy \log y dx + (1 + x^2)dy = 0$ ---- (4M)

Q 15. Solve $\frac{dy}{dx} = (4x + y + 1)^2$ ---- (4M)

Q 16. Solve $(x^2 + y^2)dx - 2xydy = 0$ ---- (4M)

Q 17. Solve $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ ---- (4M)

Q 18. Solve $x \log x \frac{dy}{dx} + y = 2 \log x$ ---- (4M)

Q 19. Solve $\frac{dy}{dx} + y \tan x = \cos^2 x$ ---- (4M)

Q 20. Solve $x \frac{dy}{dx} + y = \log x$ ---- (4M)

Q 21. Solve $\frac{dy}{dx} = \frac{x-2y}{2x-4y}$ ---- (4M)

Probability

Q 22. If A & B are two events such that $P(A) = 1/2$, $P(B) = 1/3$ & $P(A \cap B) = 7/12$
find $P(A \cup B)$ ---- (3M)

Q 23. If three coins are tossed simultaneously, find the probability of getting
almost 2 heads. ---- (3M)

Q 24. Two dice are rolled. Find the probability of getting a prime number as the
sum of numbers on the top of dices. ---- (3M)

Q 25. From a pack of 52 cards, find the probability of getting 1 queen and 1 ace if
two cards are drawn randomly. ---- (4M)

Q 26. A room has three electronics lamps. From a collection of 15 bulbs, 10 are
good, 3 are selected at random and put in lamps. Find the probability that the
room is lightened by at least one bulb. ---- (4M)

Q 27. An urn contains 10 red, 5 white and 5 black balls. Two balls are drawn at
random. Find the probability that they are not of same colour. ---- (4M)

Probability Distribution

Q 28. An unbiased coin is tossed 5 times, find the probability of getting at least 4
heads. ---- (3M)

Q 29. In poisson distribution, if $P(3) = P(4)$, find $P(1)$. ---- (3M)

Q 30. Fit a Poisson distribution to set of following observations ---- (3M)

x_i	0	1	2	3	4
f_i	122	60	15	2	1

Q 31. If 30% of the bulbs are defective, find the probability that out of 4 bulbs

Selected a) one is defective b) at the most two are defective. ---- (4M)

Q 32. Using poisson distribution, find the probability that the ace of spade will be

drown from a pack of cards at least once in 104 consecutive trials. ---- (4M)

Q 33. 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. ----(4M)

Q 34. A multiple choice test contains 20 questions. Each question has five choices

for correct answer. What is the probability of making an 80% with random

guessing. ---- (4M)

Q 35. 95% of students at college are between 1.1 m and 1.7m tall. Find mean and

S. D., assuming normal distribution. ---- (4M)