

# 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  $[0, 90^\circ]$ . --(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)