MCQs - Engineering Mathematics - I

Unit IV - Multiple Integrals

1. The value of $\int_0^1 \int_0^2 (x+y)\ dx\ dy =$

   i) 0 ii) 3 iii) 1 iv) none of these

2. The value of $\int_0^1 \int_0^{\sqrt{x}} dy\ dx =$

   i) 2/3 ii) 3/2 iii) 1/3 iv) none of these

3. If D is the region bounded by the lines $y = x$, $x = 1$ and the x-axis then $\iint_D dx\ dy =$

   i) $\int_0^1 \int_y^1 dx\ dy$ ii) $\int_0^2 \int_0^x dy\ dx$ iii) $\int_0^2 \int_y^1 dx\ dy$ iv) none of these

4. If D is the region bounded by the curves $y = x^2$ and $y^2 = x$ then $\iint_D (x^2+y^2) dx\ dy =$

   i) 1/6 ii) 1/5 iii) 6/35 iv) none of these

5. The value of $\int_0^{\pi/2} \int_1^2 r\ dr\ d\theta =$

   i) $\pi/4$ ii) $3\pi/4$ iii) π iv) none of these

6. The value of $\int_0^{\pi} \int_0^{a(1-\cos\theta)} r\ \sin\theta\ dr\ d\theta =$

   i) $4a^2/3$ ii) $4/3$ iii) $3a^2/4$ iv) none of these

7. If R is the semi-circle $r = 2\cos\theta$ above the initial line then $\iint_R r^2\ \sin\theta\ dr\ d\theta =$

   i) 2/3 ii) 3/2 iii) 8/3 iv) none of these

8. If R is the region bounded by the circles $r = 1$, $r = 2$ and the lines $\theta = 0$ and $\theta = \pi/2$ then $\iint_R r\ dr\ d\theta =$

   i) $\int_0^{\pi/2} \int_0^2 r\ dr\ d\theta$ ii) $\int_0^{\pi/2} \int_0^1 r\ dr\ d\theta$ iii) $\int_0^{\pi/2} \int_1^2 r\ dr\ d\theta$ iv) none of these

9. The value of $\int_0^2 \int_0^1 xe^{xy}\ dx\ dy =$

   i) $\int_0^1 \int_0^2 xe^{xy}\ dx\ dy$ ii) $\int_0^2 \int_0^1 xe^{xy}\ dx\ dy$ iii) $\int_0^1 \int_0^2 xe^{xy}\ dx\ dy$ iv) none of these

10. The value of $\int_1^2 \int_0^{\pi/2} x \sin(xy)\, dx\, dy =$

i) 0 ii) 2 iii) 1 iv) none of these

11. The value of $\int_1^2 \int_0^{\sqrt{4-y^2}} dx\, dy$ gives

i) The area bounded by the circle $x^2 + y^2 = 4$, the line $y = 1$ and the y-axis
ii) The area bounded by the curves $x^2 + y^2 = 4$, $y = 1$ and the coordinate axes
iii) The area bounded by the circle $x^2 + y^2 = 16$, the line $y = 1$ and the y-axis
iv) none of these

12. The area in the first quadrant bounded by the circle $x^2 + y^2 = 2$, the parabola $y = x^2$ and the x-axis is given by

i) $\int_0^1 \int_{\sqrt{y}}^{\sqrt{1-y^2}} dx\, dy$ ii) $\int_0^1 \int_{y}^{\sqrt{2-y^2}} dx\, dy$ iii) $\int_0^1 \int_{x^2}^{\sqrt{2-x^2}} dy\, dx$ iv) none of these

13. The area bounded by the circle $x^2 + y^2 = 1$, the line $y = x$ and the x-axis is given by

i) $\int_0^{\pi/4} \int_0^1 r\, dr\, d\theta$ ii) $\int_0^{\pi/2} \int_0^1 r\, dr\, d\theta$ iii) $\int_0^{\pi/4} \int_0^1 dr\, d\theta$ iv) none of these

14. The value of $\int_0^{\pi/2} \int_a^{a(1+\cos\theta)} r\, dr\, d\theta$ gives

i) the area lying outside the circle $r = a$ and inside the cardioid $r = a(1 + \cos\theta)$
ii) the area lying outside the circle $r = a$ and inside the upper half of the cardioid $r = a(1 + \cos\theta)$
iii) the area lying inside the circle $r = a$ and outside the cardioid $r = a(1 + \cos\theta)$
iv) none of these

15. $\int_0^1 \int_y^{\sqrt{2-y^2}} dx\, dy =$

i) $\int_0^{\pi/4} \int_0^{\sqrt{2}} r\, dr\, d\theta$ ii) $\int_0^{\pi/2} \int_0^{\sqrt{2}} r\, dr\, d\theta$ iii) $\int_0^{\pi/4} \int_0^{2} r\, dr\, d\theta$ iv) none of these

16. The area in the first quadrant bounded by the line $y = x$, the parabola $y = x^2 - 2$, the circle $x^2 + y^2 = 16$ and the x-axis is given by

i) $\int\limits_{\sqrt{2}}^{2} \int\limits_{0}^{x^2-2} dy\ dx + \int\limits_{2}^{2\sqrt{2}} \int\limits_{0}^{x} dy\ dx + \int\limits_{2\sqrt{2}}^{4} \int\limits_{0}^{\sqrt{16-x^2}} dy\ dx$
ii) $\int\limits_{\sqrt{2}}^{2} \int\limits_{0}^{x^2} dy\ dx + \int\limits_{2}^{2\sqrt{2}} \int\limits_{0}^{x} dy\ dx + \int\limits_{2\sqrt{2}}^{4} \int\limits_{0}^{\sqrt{16-x^2}} dy\ dx$
iii) $\int\limits_{\sqrt{2}}^{2} \int\limits_{0}^{x^2-2} dy\ dx + \int\limits_{2}^{2\sqrt{2}} \int\limits_{0}^{x} dy\ dx + \int\limits_{2}^{4} \int\limits_{0}^{\sqrt{16-x^2}} dy\ dx$
iv) none of these

17. If D_1 is the region bounded by $y = x$ and $y^2 = x$ and if D_2 is the region bounded by $y = x^2$ and $y^2 = x$ then

i) $\iint\limits_{D_1} dy\ dx = 2 \iint\limits_{D_2} dy\ dx$ ii) $\iint\limits_{D_2} dy\ dx = 2 \iint\limits_{D_1} dy\ dx$ iii) $\iint\limits_{D_1} dy\ dx = \iint\limits_{D_2} dy\ dx$
iv) none of these

18. If R_1 and R_2 are the regions bounded by the circles $r = 1$ and $r = 2\cos\theta$ respectively then

i) $\iint\limits_{R_1} r\ dr\ d\theta = \iint\limits_{R_2} r\ dr\ d\theta$ ii) $\iint\limits_{R_1} r\ dr\ d\theta > \iint\limits_{R_2} r\ dr\ d\theta$ iii) $\iint\limits_{R_1} r\ dr\ d\theta < \iint\limits_{R_2} r\ dr\ d\theta$
iv) none of these

19. The value of $\int\limits_{0}^{a} \int\limits_{0}^{b} (x^2y + xy^2)\ dx\ dy$

i) $a^2b^2\dfrac{a+b}{6}$ ii) $ab\dfrac{a+b}{6}$ iii) $a^2b^2\dfrac{a-b}{6}$ iv) none of these

20. The value of $\int\limits_{0}^{a} \int\limits_{0}^{y} dx\ dy$

i) $\dfrac{a}{2}$ ii) $\dfrac{a^2}{2}$ iii) a^2 iv) none of these

21. If $a, b > 0$ then $\int\limits_{0}^{a} \int\limits_{0}^{b} (x^2y^2)\ dx\ dy =$

i) $b\int\limits_{0}^{a} \int\limits_{0}^{b} xy^2\ dx\ dy$ ii) $a\int\limits_{0}^{a} \int\limits_{0}^{b} x^2y\ dx\ dy$ iii) $ab\int\limits_{0}^{a} \int\limits_{0}^{b} xy\ dx\ dy$ iv) none of these

22. The value of $\int\limits_{0}^{2} \int\limits_{0}^{x^2} e^{y/x}\ dy\ dx =$

i) $e^2 - 1$ ii) $e^2 + 1$ iii) e^2 iv) none of these

23. The value of $\int\limits_0^{\pi/2} \int\limits_0^2 x \ \sin y \ dx \ dy =$

i) 2 ii) -2 iii) 0 iv) none of these

24. If D is the region bounded by the lines $y = x$, $y = e$ and the y-axis then $\iint\limits_D e^{-(x/y)} dx \ dy =$

i) $\dfrac{e(e-1)}{2}$ ii) $\dfrac{e-1}{2}$ iii) $e(1-e)$ iv) none of these

25. If D is the region bounded by the curve $y = \sin x$, the line $x = \pi/2$ and the x-axis then $\iint\limits_D dy \ dx =$

i) $\int\limits_0^{\pi/2} \int\limits_0^1 \sin x \ dx \ dy$ ii) $\int\limits_0^1 \int\limits_0^{\sin x} dy \ dx$ iii) $\int\limits_0^{\pi/2} \int\limits_0^{\sin x} dy \ dx$ iv) none of these

26. The value of $\int\limits_0^{\pi/2} \int\limits_0^a \cos\theta \ dr \ d\theta =$

i) $a^2/2$ ii) a iii) a^2 iv) none of these

27. The value of $\int\limits_0^{\pi} \int\limits_0^{2a\cos\theta)} dr \ d\theta =$

i) 0 ii) $4a$ iii) $2a$ iv) none of these

28. If R is the region bounded by the circles $r = 1$, $r = 2$ and the lines $\theta = 0$ and $\theta = \pi/2$ then $\iint\limits_R r\cos\theta \ dr \ d\theta =$

i) $3/2$ ii) $2/3$ iii) 2 iv) none of these

29. If R is the semi-circle $r = 2a\cos\theta$ above the initial line then $\iint\limits_R r \ dr \ d\theta =$

i) $\int\limits_0^{\pi} \int\limits_0^{2a\cos\theta} r \ dr \ d\theta$ ii) $\int\limits_0^{2\pi} \int\limits_0^{2a\cos\theta} r \ dr \ d\theta$ iii) $\int\limits_0^{\pi/2} \int\limits_0^{2a\cos\theta} r \ dr \ d\theta$ iv) none of these

30. $\int\limits_0^{\infty} \int\limits_0^{\sqrt{y}} e^{-(y/x)} dx \ dy =$

i) $\int\limits_0^{\infty} \int\limits_{x^2}^{\infty} e^{-(y/x)} \ dy \ dx$ ii) $\int\limits_0^{1} \int\limits_{x^2}^{\infty} e^{-(y/x))} \ dy \ dx$ iii) $\int\limits_0^{1} \int\limits_{x^2}^{1} e^{-(y/x)} \ dy \ dx$ iv) none of these

31. The value of $\int\limits_1^{2} \int\limits_0^{\pi/2} y\cos(xy) \ dy \ dx =$

i) 1 ii) 2 iii) 0 iv) none of these

32. The value of $\int_0^1 \int_0^{x^2} dy\ dx$ gives

i) The area bounded by the parabola $y = x^2$, the line $x = 1$ and the x-axis
ii) The area bounded by the parabolas $y = x^2$ and $y^2 = x$
iii) The area bounded by the parabola $y = x^2$, the line $y = 1$ and the y-axis
iv) none of these

33. The area bounded by the curve $y = e^x$ and the lines $x = 1$ and $y = 1$ is given by

i) $\int_0^1 \int_0^{e^x} dy\ dx$ ii) $\int_0^1 \int_0^1 dx\ dy$ iii) $\int_0^2 \int_1^{e^x} dy\ dx$ iv) none of these

34. The area bounded by the circle $r = 1$ and the lines $\theta = \pi/4$ and $\theta = \pi/2$ is given by

i) $\int_{\pi/4}^{\pi/2} \int_0^1 r\ dr\ d\theta$ ii) $\int_0^{\pi/2} \int_0^1 r\ dr\ d\theta$ iii) $\int_0^{\pi/4} \int_0^1 dr\ d\theta$ iv) none of these

35. The value of $\int_0^{\pi/2} \int_{a(1-\cos\theta)}^{a} r\ dr\ d\theta$ gives

i) the area lying inside the circle $r = a$ and outside the cardioid $r = a(1 - \cos\theta)$
ii) the area lying inside the circle $r = a$ and outside the upper half of the cardioid $r = a(1 - \cos\theta)$
iii) the area lying outside the circle $r = a$ and inside the cardioid $r = a(1 - \cos\theta)$
iv) none of these

36. $\int_0^2 \int_x^{\sqrt{8-x^2}} dy\ dx =$

i) $\int_{\pi/4}^{\pi/2} \int_0^{2\sqrt{2}} r\ dr\ d\theta$ ii) $\int_0^{\pi/2} \int_0^{2\sqrt{2}} r\ dr\ d\theta$ iii) $\int_0^{\pi/4} \int_0^{\sqrt{2}} r\ dr\ d\theta$ iv) none of these

37. The area in the first quadrant bounded by the line $y = x + 1$, the circle $x^2 + y^2 = 2$ and the coordinate axes is given by

i) $\int_0^1 \int_0^{\sqrt{2-y^2}} dx\ dy + \int_1^{(\sqrt{3}+1)/2} \int_{y-1}^{\sqrt{2-y^2}} dx\ dy$
ii) $\int_0^1 \int_0^{\sqrt{2-y^2}} dx\ dy + \int_1^{(\sqrt{3}+1)/4} \int_{y-1}^{\sqrt{2-y^2}} dx\ dy$
iii) $\int_0^1 \int_1^{\sqrt{2-y^2}} dx\ dy + \int_1^{(\sqrt{3}+1)/2} \int_{y-1}^{\sqrt{2-y^2}} dx\ dy$
iv) none of these

38. If D_1 is the region bounded by the circle $x^2+y^2=1$ and if D_2 is the region bounded by the lines $y=1$, $x=\pi$ and the coordinate axes then

i) $\iint\limits_{D_1} dy\ dx = 2\iint\limits_{D_2} dy\ dx$ ii) $\iint\limits_{D_2} dy\ dx = \iint\limits_{D_1} dy\ dx$ iii) $2\iint\limits_{D_1} dy\ dx = \iint\limits_{D_2} dy\ dx$
iv) none of these

39. If R_1 and R_2 are the regions bounded by the circles $r=2$ and $r=2\cos\theta$ respectively then

i) $\iint\limits_{R_1} r\ dr\ d\theta > \iint\limits_{R_2} r\ dr\ d\theta$ ii) $\iint\limits_{R_1} r\ dr\ d\theta = \iint\limits_{R_2} r\ dr\ d\theta$ iii) $\iint\limits_{R_1} r\ dr\ d\theta < \iint\limits_{R_2} r\ dr\ d\theta$
iv) none of these

40. If $a,b>0$ then $\int\limits_0^a \int\limits_0^b 2xy\ dx\ dy =$

i) $b\int\limits_0^a \int\limits_0^b y\ dx\ dy$ ii) $a\int\limits_0^a \int\limits_0^b y\ dx\ dy$ iii) $ab\int\limits_0^a \int\limits_0^b x\ dx\ dy$ iv) none of these

41. If $\int\limits_0^1 \int\limits_0^1 (ax^2y - xy^2)\ dy\ dx = \int\limits_0^1 \int\limits_0^1 (x^2y - bxy^2)\ dy\ dx$ then

i) $a \geq b$ ii) $a+b=2$ iii) $a \leq b$ iv) none of these

42. If $\int\limits_0^1 \int\limits_0^1 a(x^2y - xy^2)\ dy\ dx = \int\limits_0^1 \int\limits_0^1 b(x^2y - xy^2)\ dy\ dx$ then

i) $a=b$ ii) $a>b$ iii) $a<b$ iv) none of these

43. The value of $\int\limits_0^3 \int\limits_0^2 \int\limits_0^1 8xyz\ dx\ dy\ dz =$

i) 36 ii) 9 iii) 4 iv) none of these

44. The value of $\int\limits_0^a \int\limits_0^b \int\limits_0^c (x+y+z)\ dx\ dy\ dz =$

i) $\dfrac{abc(a+b+c)}{2}$ ii) $\dfrac{abc}{2}$ iii) $\dfrac{a+b+c}{2}$ iv) none of these

45. The value of $\int\limits_0^1 \int\limits_{y^2}^1 \int\limits_0^{1-x} x\ dz\ dx\ dy =$

i) 1/12 ii) 31/210 iii) 4/35 iv) none of these

46. The volume of the solid bounded by the planes $x = 0$, $y = 0$, $z = 0$ and $x+y+z = 1$ is given by

i) $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} dz\ dy\ dx$ ii) $\int_0^1 \int_0^x \int_0^y dz\ dy\ dx$ iii) $\int_0^1 \int_0^x \int_0^{x+y} dz\ dy\ dx$ iv) none of these

47. The value of $\int_0^a \int_0^a \int_0^a dx\ dy\ dz$ gives

i) the volume of a cube with side a ii) the volume of a sphere with radius a

iii) the volume of a right circular cylinder with base radius a iv) none of these

48. The value of $\iiint\limits_V xy\ dz\ dy\ dx$ where V is the volume of the tetrahedron $x = 0$, $y = 0$, $z = 0$ and $x + y + z = 2$ is

i) 2/3 ii) 3/2 iii) 1 iv) none of these

49. If $\int_0^a \int_0^b \int_0^c x\ dz\ dy\ dx = \int_0^a \int_0^b \int_0^c y\ dz\ dy\ dx$ then

i) $a = b$ ii) $b = c$ iii) $a = c$ iv) none of these

50. If $\int_0^1 \int_0^2 \int_0^3 ax\ dz\ dy\ dx = \int_0^1 \int_0^2 \int_0^3 by\ dz\ dy\ dx$ then

i) $a = 2b$ ii) $b = 2a$ iii) $a = b$ iv) none of these

Answers

1. ii
2. i
3. i
4. iii
5. ii
6. i
7. i
8. iii
9. i

10. iii
11. i
12. iv
13. i
14. ii
15. i
16. i
17. ii
18. i
19. i
20. ii
21. iv
22. ii
23. i
24. i
25. iii
26. ii
27. i
28. i
29. iii
30. i
31. iii
32. i
33. iv
34. i

35. ii
36. i
37. i
38. ii
39. i
40. i
41. ii
42. iv
43. i
44. i
45. iii
46. i
47. i
48. iv
49. i
50. i