Duration: 1 hour   **Marks: 30**

SECTION A

Each carry 1 mark

1. $\int x^2 e^{x^3} dx$ is equal to

(a) $\frac{1}{3} e^{x^3} + C$ (b) $\frac{1}{3} e^{x^4} + C$ (c) $\frac{1}{2} e^{x^3} + C$ (d) $\frac{1}{2} e^{x^2} + C$

2. $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$ is equal to

(a) $\tan(xe^x) + C$ (b) $\cot(xe^x) + C$ (c) $\cot(e^x) + C$ (d) $\tan[e^x(1+x)] + C$

3. $\int_{-1}^{1} \frac{|x-2|}{x-2} dx, x \neq 2$ is equal to

(a) 1   (b) -1   (c) 2   (d) -2

4. $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sec^2 x \, dx$ is equal to

(a) -1   (b) 0   (c) 1   (d) 2

5. Assertion: If $f'(x) = x + \frac{1}{1+x^2}$ and $f(0) = 0$ then $f(x) = \frac{x^2}{2} + \tan^{-1} x$.

Reason: $\int x^n dx = \frac{x^{n+1}}{n+1} + C$

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

SECTION B

Each carry 2 marks

6. Find $\int \dfrac{dx}{\sqrt{4x-x^2}}$

7. Find $\int \dfrac{dx}{x^2-6x+13}$

8. Evaluate: $\int_0^1 x^2 e^x dx$

SECTION C

Each carry 3 marks

9. Find: $\int e^x \cdot \sin 2x\, dx$

10. Find: $\int \dfrac{2x}{(x^2+1)(x^2+2)} dx$

11. Find $\int \dfrac{dx}{\sqrt{\sin^3 x\cos(x-\alpha)}}$.

SECTION C

Each carry 5 marks

12. Find: $\int \dfrac{\sqrt{x^2+1}[\log(x^2+1)-2\log x]}{4} dx$

13. Evaluate: $\int_1^4 (|x-1| + |x-2| + |x-4|)dx$

UNIT TEST Answer

1. (a) $\frac{1}{3}e^{x^3} + C$

2. (a) $\tan(xe^x) + C$

3. (d) -2

4. (d) 2

5. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

6. $\sin^{-1}\left(\frac{x-2}{2}\right) + C$

7. $\frac{1}{2}\tan^{-1}\left(\frac{x-3}{2}\right) + C$

8. $e - 2$

9. $\frac{e^x}{5}(\sin 2x - 2\cos 2x) + C$

10. $\log\left|\frac{x^2+1}{x^2+2}\right| + C$

11. $\frac{-2}{\cos\alpha}\sqrt{\sin\alpha + \cos\alpha\cot x} + C$

12. $= \frac{-1}{3}\left[\left(\frac{x^2+1}{x^2}\right)^{3/2}\log\left(\frac{x^2+1}{x^2}\right) - \frac{2}{3}\left(\frac{x^2+1}{x^2}\right)^{3/2}\right] + C$

13. $\frac{23}{2}$