



Date: 10-05-2025

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A - K1 (CO1)

Answer ALL the Questions -

(10 x 1 = 10)

1. Answer the following

- a) Examine the derivative of $xe^x \sin x$.
- b) Write the expansion of $(1+x)^n$.
- c) Evaluate $\int (2x+1)^3 dx$.
- d) Express $\cos 3\theta$ in terms of $\cos \theta$.
- e) Define Poisson distribution.

2. Fill in the blanks

- a) The angle between the radius vector and the tangent is
- b) The expansion of $\frac{e^x + e^{-x}}{2}$ is.....
- c) The statement of Bernoulli's formula for integration is
- d) The value of $(\cos \theta - i \sin \theta)^5$ is
- e) Spearman's formula for the rank correlation is

SECTION A - K2 (CO1)

Answer ALL the Questions

(10 x 1 = 10)

3. MCQ

- a) What is the differential co-efficient of x^n ?
(i) nx^{n-1} (ii) $(n-1)x^{n-1}$ (iii) $(n+1)x^{n+1}$ (iv) $\frac{x^{n-1}}{n}$
- b) Which of the following can be used to find infinite sum?
(i) Binomial series expansion (ii) Exponential series expansion (iii) Logarithmic series expansion (iv) All the above
- c) $\int_0^2 (x^2 + 3) dx$ equals.....
(i) $\frac{26}{3}$ (ii) $\frac{26}{9}$ (iii) $\frac{28}{3}$ (iv) $\frac{24}{3}$
- d) $(2\cos \theta)^n = \dots\dots\dots$
(i) $\left(\frac{x-x_0}{n}\right)$ (ii) $\left(x + \frac{1}{x}\right)^n$ (iii) $\left(x - \frac{1}{x}\right)^n$ (iv) $\left(x - \frac{1}{x}\right)^{-n}$
- e) If $r = 1$, the angle between the two regression line is
(i) Ninety degree (ii) Sixty degree (iii) Thirty degree (iv) Zero degree

4. True or False

- a) The polar subtangent is always a positive quantity.
- b) The binomial theorem can be used to find $(x+y)^n$ where n is a positive integer.
- c) The integral of a constant function is always zero.
- d) The terms are alternatively positive and negative in the expansion of $\sin n\theta$.
- e) The mean and variance of the Poisson distribution are both equal to the parameter λ .

SECTION B - K3 (CO2)**Answer any TWO of the following****(2 x 10 = 20)**

5. Show that the curves $y^2 = 4(x + 1)$ and $y^2 = 36(9 - x)$ cut orthogonally.
6. Find the sum to infinity of the series $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$
7. Using partial fraction method, compute $\int \frac{2x+3}{(1-x^2)(1+3x)} dx$.
8. Express $\sin 7\theta$ in terms of $\sin \theta$.

SECTION C – K4 (CO3)**Answer any TWO of the following****(2 x 10 = 20)**

9. If $r^2 = (x - a)^2 + (y - b)^2 + (z - c)^2$, prove that $\frac{\partial^2 r}{\partial x^2} + \frac{\partial^2 r}{\partial y^2} + \frac{\partial^2 r}{\partial z^2} = \frac{2}{r}$.
10. Evaluate $\int \frac{2x+1}{x^2+3x+1} dx$.
11. Show that $\sin^5 \theta = \frac{1}{16} [\sin 5\theta - 5\sin 3\theta + 10\sin \theta]$.
12. A recruiting agency shortlisted 10 candidates for final selection they were examined in written and oral communication skills. They were ranked as follows:
- | | | | | | | | | | | |
|---------------|----|---|---|----|---|---|---|---|---|---|
| Written skill | 8 | 7 | 2 | 10 | 3 | 5 | 1 | 9 | 6 | 4 |
| Oral skill | 10 | 7 | 2 | 6 | 5 | 4 | 1 | 9 | 8 | 3 |
- Analyse whether there is any correlation between the written and oral communication skills of the shortlisted candidates.

SECTION D – K5 (CO4)**Answer any ONE of the following****(1 x 20 = 20)**

13. a. Evaluate $\sum_{n=0}^{\infty} \frac{n^2+5}{(n+1)} \cdot x^n$.
b. Find the equation of the tangent to the parabola $y^2 = 4ax$ at (x_1, y_1) .
14. a. Show that $\frac{\sin 6\theta}{\sin \theta} = 32\cos^5 \theta - 32\cos^3 \theta + 6\cos \theta$.
b. Calculate the standard deviation for the following data 14, 22, 9, 15, 20, 17, 12, 11.

SECTION E – K6 (CO5)**Answer any ONE of the following****(1 x 20 = 20)**

15. a. Evaluate $\int x^3 \cos 2x dx$.
b. Show that $\left(1 + \frac{1}{2!} + \frac{1}{4!} + \dots\right)^2 = 1 + \left(1 + \frac{1}{3!} + \frac{1}{5!} + \dots\right)^2$.
16. Using Karl Pearson's method, estimate the coefficient of correlation for the following heights (in inches) of fathers (x) and their son's (y).

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

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