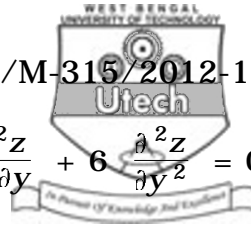


- 2



viii) The complete solution of $\frac{\partial^2 z}{\partial x^2} - 5 \frac{\partial^2 z}{\partial x \partial y} + 6 \frac{\partial^2 z}{\partial y^2} = 0$ is

a) $z = f_1(y + 2x) + f_2(y - 3x)$

b) $z = f_1(y - 2x) + f_2(y - 3x)$

c) $z = f_1(y - 2x) + f_2(y + 3x)$

d) $z = f_1(y + 2x) + f_2(y + 3x).$

ix) If $f(x)$ is an odd function then for the Fourier expansion of $f(x)$, given by

$$\frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx), \text{ the correct}$$

statement is

a) $a_0 = 0, a_n \neq 0$ b) $a_0 \neq 0, a_n = 0$

c) $a_0 = 0, a_n = 0$ d) $a_0 \neq 0, a_n \neq 0.$

x) If $f(x)$ is a periodic function of period T , then the correct statement is

a) $f(x + T) = f(x) + T$

b) $f(x + t) = f(x) - T$

c) $f(x + T) = f(x)$

d) $f(x + T) = f(x) - f(T).$



xi) The graph of the periodic function

$$f(x) = -k, -a \leq x < 0$$

$$= k, 0 < x \leq a$$

and $f(x + 2a) = f(x)$ for all x is a

- a) square waveform b) saw-toothed waveform
c) triangular waveform d) half-wave rectifier.

xii) For the random variable X , the expression for $\text{Var}(aX + b)$ is

- a) $a \text{Var}(X)$ b) $a \text{Var}(X) + b$
c) $\text{Var}(X) + ab$ d) $a^2 \text{Var}(X)$

xiii) The mean of a random variable having Poisson distribution with parameter 4 is

- a) 1 b) 2
c) 3 d) 4.

xiv) Let (x, y) be a bivariate data assumed by a bi-variate (X, Y) , then correlation coefficient of x & y is

- a) $\frac{1}{\sigma_x \sigma_y}$ b) $\frac{\text{cov}(x, y)}{\sigma_x \sigma_y}$
c) $\frac{\sigma_x \sigma_y}{\text{cov}(x, y)}$ d) $\sigma_x \sigma_y$.

**GROUP - B****(Short Answer Type Questions)**Answer any *three* of the following.

$3 \times 5 = 15$

2. Obtain the Fourier expansion of $x \sin x$ in $-\pi \leq x \leq \pi$.
3. Eliminate the arbitrary functions from the relation $z = f_1(x + ay)$ and form the corresponding partial differential equation.
4. Solve the following partial differential equation

$$(mz - ny) \frac{\partial z}{\partial x} + (nx - lz) \frac{\partial z}{\partial y} = (ly - mx)$$
5. Solve in series the equation $\frac{d^2 y}{dx^2} + (x - 1) \frac{dy}{dx} + y = 0$ in the power of $(x - 2)$.
6. A sample of 506 persons showed the income distribution given below :

| Income (Rs.) | No. of persons |
|-----------------------|-----------------------|
| 150 — 300 | 232 |
| 300 — 450 | 128 |
| 450 — 600 | 60 |
| 600 — 750 | 40 |
| 750 — 900 | 28 |
| 900 — 1100 | 12 |
| 1100 — 1150 | 6 |

Find out the standard deviation.

7. If the probability of the horse A winning the race is $\frac{1}{5}$ and the probability of the horse B winning the same race is $\frac{1}{6}$, what is probability that one of the horses will win the race ?

**GROUP - C****(Long Answer Type Questions)**Answer any *three* questions. $3 \times 15 = 45$

8. a) Show that when n is a pentive integer, $J_{-n}(x) = (-1)^n J_n(x)$.

Solve : $(D^2 - 7DD')z = e^{x+2y} \left(D \frac{\partial}{\partial x}, D' = \frac{\partial}{\partial y} \right)$

- b) Find the particular solution of the partial differential equation

$(y-z) \frac{\partial z}{\partial x} + (z-x) \frac{\partial z}{\partial y} = x-y$ which passes through the curve $xy = 4, z = 0$.

- c) Solve by the method of separation of variables :

$3 \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0, u(x, 0) = 4e^{-x}. \quad 5 + 5 + 5$

9. a) Find the Fourier expansion of x^2 on $[-\pi, \pi]$. Hence prove that

$$1 + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi}{6}.$$

- b) Find the half range sine series of the function $f(x) = x, 0 \leq x \leq 2$.

- c) Find the Fourier series corresponding to the function

$$f(x) = -x - \pi, -1 < x < 0$$

$$= \pi - x, 0 < x < \pi$$

What is the value of the series at $x = 0$.



10. a) If X has Binomial distribution with parameters n and p then prove that its mean is np and variance is $np(1 - p)$.
- b) If the weekly wage of 10,000 workers in a factory follows normal distribution with mean and s.d. Rs. 70 and Rs. 5 respectively, find the expected number of workers whose weekly wages are
- between Rs. 66 and Rs. 72
 - less than Rs. 66
 - more than Rs. 72

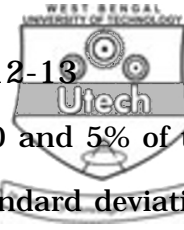
$$\left[\text{Given that } \frac{1}{\sqrt{2\pi}} \int_0^z e^{-\frac{t^2}{2}} dt = 0.1554 \text{ \& } 0.2881 \text{ according as } z = 0.4 \text{ \& } z = 0.8 \right]$$

11. a) Let the lines of regression of two variables x and y be given by $y = 32 - x$ and $x = 13 - 0.25y$. Obtain the values of the mean and the correlation coefficients.
- b) Find the regression equation from the following data :

$$\sum_{i=1}^n X = 24 \quad \sum_{i=1}^n Y = 44 \quad \sum_{i=1}^n XY = 306$$

$$\sqrt{\frac{2}{\pi X}} \sin x, \quad \sum_{i=1}^n Y^2 = 574, \quad n = 4$$

Find the estimated values of X when $Y = 6$.



- c) The mean of a normal distribution is 50 and 5% of the values are greater than 60. Find the standard deviation of the distribution (given that the area under the standard normal curve between $Z = 0$ and $Z = 1.64$ is 0.45). 5 + 5 + 5

12. a) If $P_n(x)$ is a Legendre polynomial of degree n and α is such that $P_n(\alpha) = 0$ then prove that

$P_{n-1}(\alpha)$ and $P_{n+1}(\alpha)$ are of opposite signs.

- b) Solve $xy'' + 8y' + 5y = 0$ in series.

- c) Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

=====