18STU06
Cont...

b If $L[f(t)] = F(s)$, then prove that $L[F(at)] = \frac{1}{a}F\left(\frac{s}{a}\right)$.

10 a Solve by Gauss-Jordan method the equations
$2x + y + 4z = 12$
$8x - 3y + 2z = 20$
$4x + 11y - z = 33$

OR

b Compare Gauss elimination and Gauss-Seidel iteration methods.

SECTION -C (30 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 6 = 30)

11 a Evaluate the matrix $A^6 - 25A^2 + 122A$, where $A = \begin{bmatrix} 0 & 0 & 2 \\ 2 & 1 & 0 \\ -1 & -1 & 3 \end{bmatrix}$.

OR

b Diagonalise the matrix $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{bmatrix}$.

12 a Solve (i) $q = xp + p^2$ (ii) $p = y^2q^2$ (iii) $p(1+q^2) = q(z-1)$.

OR

b (i) Find the general solution of $(y+z)p + (z+x)q = x + y$.
(ii) Solve $x^2\frac{\partial z}{\partial x} + y^2\frac{\partial z}{\partial y} = (x+y)z$.

13 a Show that $x^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty}(-1)^n\frac{\cos nx}{n^2}$ in the interval $-\pi \le x \le \pi$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots = \frac{\pi^2}{12}$.

OR

b Find a cosine series in the range 0 to π for
$f(x) = x, \quad 0 < x < \frac{\pi}{2}$
$= \pi - x, \quad \frac{\pi}{2} < x < \pi$

14 a Solve the equation $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 13y = 2e^{-x}$, given $y = 0, \frac{dy}{dx} = -1$ when $x = 0$.

OR

b Show that the solution of the differential equation $\frac{d^2y}{dt^2} + 4y = A\sin pt$ which is such that $y = 0$ and $\frac{dy}{dt} = 0$ when $t = 0$ is $y = A\frac{\sin pt - \frac{p}{2}\sin 2t}{4 - p^2}$ if $p \ne 2$.

15 a Solve by Gaussian elimination procedure, the equations
$5.15x - 1.96y + 3.85z = 12.95$
$2.13x + 5.12y - 2.89z = -8.61$
$5.92x + 3.05y + 2.15z = 6.88$

OR

b Solve by Gauss-Jacobi method of iteration the equations
27x+6y-z=85
6x+15y+2z=72
x+y+54z=110

Z-Z-Z END

18STU11

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2022
(Fourth Semester)

Branch – **STATISTICS**

STATISTICAL INFERENCE-I

Time: Three Hours | Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1. Let T_n be an estimator of θ. If $E(T_n) = \theta$, then
   (i) T_n is a sufficient estimator of θ
   (ii) T_n is an unbiased estimator of θ
   (iii) T_n is a consistent estimator of θ
   (iv) T_n is an efficient estimator of θ

2. If T_1 and T_2 are consistent estimators and if $V(T_1) < V(T_2)$, then
   (i) T_1 is more efficient than T_2
   (ii) T_2 is more efficient than T_1
   (iii) T_1 and T_2 are equally efficient
   (iv) T_1 and T_2 are not efficient

3. If $x_1, x_2, \dots, x_n$ be a random sample from a population $p^x(1-p)^{1-x}$ for $x = 0,1$ and $0 < p < 1$, the sufficient statistics for p is:
   (i) $\sum_{i=1}^{n} x_i$
   (ii) $\prod_{i=1}^{n} x_i$
   (iii) $\sum_{i=1}^{\infty} x_i$
   (iv) $\sum_{i=1}^{n} log x_i$

4. Factorisation theorem for sufficiency is known as
   (i) Rao-Blackwell Theorem
   (ii) Cramer-Rao Theorem
   (iii) Fisher-Neyman Theorem
   (iv) Neyman-Pearson Theorem.

5. Method of moments for estimating the parameters was discovered by
   (i) Jerzy Neyman
   (ii) Cramer Rao
   (iii) R.A.Fisher
   (iv) Karl Pearson

6. In random sampling from normal population $N(\mu, \sigma^2)$ the maximum likelihood estimator for σ^2 is
   (i) $\hat{\sigma}^2 = \frac{1}{n^2}\sum_{i=1}^{n}(x_i - \mu)^2$
   (ii) $\hat{\sigma}^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2$
   (iii) $\hat{\sigma}^2 = \sum_{i=1}^{n}(x_i - \mu)^2$
   (iv) $\hat{\sigma}^2 = \frac{1}{n^2}\sum_{i=1}^{n}(x_i - \mu)^3$

7. 95% confidence interval for the mean μ of a normal population $N(\mu, \sigma^2)$ with known σ is:
   (i) $\left(-1.96 \le \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \le 1.96\right)$
   (ii) $\left(-2.58 \le \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} \le 2.58\right)$
   (iii) $(-1.96 \le \frac{\bar{x}-\mu}{n} \le 1.96)$
   (iv) $(-2.58 \le \frac{\bar{x}-\mu}{n} \le 2.58)$

8. The term $(1-\alpha)$ refers to the:
   (i) level of confidence plus one
   (ii) level of significance
   (iii) level of confidence minus one
   (iv) confidence coefficient

9. Sampling distribution of R (run) can be approximated by ______, with known mean and standard deviation.
   (i) poisson distribution
   (ii) uniform distribution
   (iii) normal distribution
   (iv) binomial distribution

Cont...