Q1// Let W be a random variable having p.d.f. W$\sim N(0,1)$ and V random variable with p.d.f. V$\sim x_r^2$ and Wand V are independent random variable , then the p.d.f. of $T = W/\sqrt{V/r}$ is known as T distribution proof that :

$$f(t) = \frac{\Gamma\frac{r+1}{2}}{\Gamma\frac{r}{2}\sqrt{r\pi}} \ (1+\frac{t^2}{r})^{\frac{-(r+1)}{2}} \quad ; \ -\infty < T < \infty$$

Q2// In a r.s.s.n. show that $T = \bar{X}$ is efficient est. for

$\emptyset(\theta) = \theta \ from \ \exp(\theta)$

Q3//Researchers are interested in the mean age of a certain population. A random sample of 10 individuals drawn from the population of interest has a mean of 27. Assuming that the population is approximately normally distributed with variance 20, can we conclude that the mean is different from 30 years , (α=0.05) ?

where $Z_{0.025}$ =1.96 , $Z_{0.10}$ =1.28 , $Z_{0.05} = 1.64$

Q4 // Let x be a r.v. with p.d.f.

$$f(x) = \begin{cases} (\frac{2}{c})^{-x} & x = 1,2,3,\dots. \\ = 0 & o.w. \end{cases}$$

Find: c=?

Q5 // Find Bayes estimator for parameters of $N(\theta,\sigma^2)$ using non information prior probability . (-15 -Marks)

Q6//Let $x \sim U(-2,2)$ find the p.d.f. of $Y = |x|$?

Q7**//** Let $x_1, x_2,$ be a r.s.s. taken from $\exp(\theta)$ and $y_1 = x_1 + x_2$ and $y_2 = x_2$ and $x_1 \ and \ x_2$ are independent show that :-

1) $E[E(y_2/y_1)] = Ey_2$ 2) $V[E(y_2/y_1)] < V(y_2)$
(15-Marks)

Q8// the results for the pre-and post-tests are below :

subject	1	2	3	4	5	6	7	8	9
Pre-test	78	67	56	78	96	82	84	90	87
Post-test	80	69	70	79	96	84	88	92	92

Is there difference between the mean of the pre – test and post-test , Use α=0.05   (8-mark)

Q9// The mean of random experiment is 8.33 and $s^2 = 20.31$,$\sum\ x^2$=787 find confidence interval %99 for mean.
(7-mark)

Q10// If $f(x;\theta;\alpha) = \theta\alpha^\theta x^{-\theta-1}$ for $x \geq \alpha$ and $\theta \geq 1$ where θ and α are positive parameters of the distribution ,assume that α is known and that $x_1, x_2, x_3, \dots, x_n$ is a r.s. of size n from this distribution find moment and m.l.e. estimate for θ ,are the differ?
(15-mark)

Q11// Find Bayes estimator for parameter of $N(\theta,\sigma^2)$, using information prior probability when σ^2

If $x \sim po(\theta)$, show that if we can apply (RAO-BLAK WELL THEORM) to EE($x_1/\sum_{i=1}^{n} x_i$)?

Q12// construct a 95% C.I. for the mean life of light bulbs given that a r.s. of size n=7 ,and with a s.d. =20 hours the average live time = 420 ,

$Z_{0.025} = 1.96$, $t_{(0.025,6)}$=2.447 ,$t_{(0.025,7)}$=2.365 ,
$t_{(0.05,7)}$=1.895, $Z_{0.05} = 1.645$

Q13//Find Bayes estimator for parameter of $N(\theta, \sigma^2)$, using non information prior probability.

Q15// Let $y_1 < y_2 < y_3 < y_4 be$ a order statistics of a r.v.s.4 taken from p.d.f. $f(x) = 1 \quad ,0 < x < 1$ and let $z_1 = y_2 - y_1 \ , \ z_2 = y_2$

Find : $1)g(y_1)$ $\quad 2)E(y_1)$ $\quad 3)h(z_1)$

Q16// let $y_1 < y_2 < y_3 < y_4 < y_5$be the order statistics from $\exp\left(\frac{1}{\theta}\right), find\ 1)g(y_2),\ 2)g(y_{n-1})$

Q17// let $y_1 < y_2 < y_3 < y_4 < y_5$ be the order statistics from $\beta(2,1) find$

1- largest value and expected

2-find smallest value

3-find pdf of median

4- the J.p.d.f. of g(y_2/y_5)

Q18// Let $y_1 < y_2 < y_3 < y_4 be$ a order statistics of a r.v.s.4 taken from p.d.f. $f(x) = 1 \quad ,0 < x < 1$ and let $z_1 = y_2 - y_1 \ , \ z_2 = y_2$

Find : $1)g(y_1)$ $\quad 2)E(y_1)$ $\quad 3)h(z_1)$

Q19// let $(y_1 \leq y_2 \leq \cdots \leq y_5)$ be the order statistics , of a random sample size 5 with p.d.f.

$f(x, \theta) = e^{-(x-\theta)} \ , \quad \theta < x < \infty$

Find: $g(y_1), g(y_2), g(y_n) and\ g(y_3, y_n)$

Q20// Let X_1 and X_2 have independent gamma distribution with parameters $\propto, \theta\ and\ \beta, \theta$ respectively. If $z_1 = \frac{x_1}{x_1+x_2}$ and $Z_2 = X_1 + X_2$, find the j.p.d.f. of Z_1, and Z_2.

Q21// If the p.d.f. of X is $f(x) = \begin{Bmatrix} 2e^{-2x} & x > 0 \\ 0 & o.w \end{Bmatrix}$

Find the p.d.f.of $=Y = \sqrt{X}$

Q22// If $X \sim N(M, \sigma)$ find the p.d.f. of $\frac{X-\mu}{\sigma}$

Q23// if $X_1 \sim b(n_1, p), X_2 \sim b(n_2, p)$ and independent. Let $Y_1=X_1+X_2$ and $Y_2=X_2$ find the j.p.d.f of Y_1 and Y_2?

Q24// Among 157 African-American men ,the mean systolic blood pressure was 146 mm Hg with a standard deviation of 27. We wish to know if on the basis of these data, we may conclude that the mean systolic blood pressure for a population of African-American is greater than 140. Use α=0.01.

Q25// Researchers are interested in the mean age of a certain population. A random sample of 10 individuals drawn from the population of interest has a mean of 27. Assuming that the population is approximately normally distributed with variance 20,can we conclude that the mean is different from 30 years ? (α=0.05) .

Q26// is $\overline{X}$ unbiased estimation for $\emptyset(\theta)= \theta$ of

1- Ber(θ)   2- poisson (θ)

Q27// let $y_1 < y_2 < y_3$ be the order statistics of a r.s.s.3 from uniform(0, θ)are

1)$4y_1$ 2)$2y_2$ 3)$\frac{4}{3}y_3$ unbiased est. for θ

Q28// from N(θ, σ^2) find biased part for θ^2 if T=$\bar{x}^2$

Q29// from $un(0, \theta), find\ biased\ part\ for\ \theta\ if\ T = \bar{X}$

Q30// from $\exp(\theta)\ is\ \bar{x}\ unbiased\ est.in\ limt\ for\ \theta$