



HEG-003-1171002 Seat No. _____

M. Sc. (Statistics) (Sem. I) (CBCS) Examination

November / December – 2017

MS-102 : Statistical Computing & Numerical Methods

Faculty Code : 003

Subject Code : 1171002

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions :

- (1) Attempt all questions.
- (2) Each question carries equal marks.

1 Answer the following : (any seven) 14

- (1) Y is the vector c(22, 35, 36, 39, 40). Which function is used to find third quartile in R ?
- (2) R was created by Ross Ihaka and Robert Gentleman at the University of Auckland, _____.
- (3) Write R-programme to generate five uniform pseudorandom numbers on the interval [0, 1], and 10 uniform such numbers on the interval [-3, -1].
- (4) What is the difference between "%%" and "%%" ?
- (5) What is the use of ceiling() function in R ?
- (6) Which function is used to create a Stem-and -leaf plot in R ?
- (7) X is the vector c(15, 19, 12, 13, 18). What is the output of var(x) ?
- (8) Give the command to create a bar chart.
- (9) Which function in R language is used to find out whether the means of two normally distributed groups are equal to each other or not ?
- (10) Which test used to check normality assumption for sample size between 5 to 2000 ?

- 2 Answer the following : (any two) 14
- (a) Write R-commands for Newton-Raphson iteration method to estimate the root of the following function employing an initial guess of $x_0=3$, $f(x)=x^2-2x-2$.
- (b) Explain Inverse transformation method with example for discrete distribution.
- (c) Write a programme to simulate a random sample of size 50 from the distribution with density $f_x(x) = 4x^3$.

- 3 Answer the following : 14
- (a) Write a program to generate 30 pseudorandom numbers using $x_n = 170x_{n-1} \pmod{30308}$ with initial seed $x_0=17316$.
- (b) Discuss test procedure of Wilcoxon Mann-Whitney U test in R.

OR

- 3 Answer the following : 14
- (a) The tax revenue of India (in crores of Rs.), provided in 1984-85 budget, when broken into various sources are given below :

| Sources | Excise | Customs | Corporation tax | Income tax | Others |
|-------------|--------|---------|-----------------|------------|--------|
| Tax Revenue | 6526 | 7108 | 2568 | 560 | 763 |

Write R-commands to draw Pie-chart.

- (b) Explain multiplicative congruential method of generating uniform variate.
- 4 Answer the following : (any two) 14
- (a) Write algorithm to generate 5 random numbers from logarithmic distribution with parameter $\theta=0.7$.
- (b) State the assumptions of one sample t-test and write R-programme for one sample t-test.
- (c) Use the Gauss-Seidel iteration method to approximate the solution to the system of linear equations,

$$\begin{aligned} 5x_1 - 2x_2 + 3x_3 &= -1 \\ -3x_1 + 9x_2 + x_3 &= 2 \\ 2x_1 - x_2 - 7x_3 &= 3 \end{aligned}$$

Continue the iterations until two successive approximations are identical when rounded to three significant digits.

5 Answer the following : (any two)

14

- (a) Explain the Jacobi iterative method for solving linear system of equations.
- (b) Write R-programme to find the root of $f(x) = x^2 - 3$. Let $\epsilon_{step} = 0.01$, $\epsilon_{abs} = 0.01$ and start with the interval $[1, 2]$.
- (c) Explain Bisection method to find solution of non-linear equation.
- (d) Use the Newton-Raphson iteration method to estimate the root of the following function employing an initial guess of $x_0 = 4$, $f(x) = 2x^3 - 3x + 5$.
