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SUBJECT CODE NO:- B-2047
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-V) Examination OCT/NOV 2019
Mathematics MAT-503 1) Mathematical Statistics - I

[Time: 1:30 Hours]

[Max. Marks:50]

Please check whether you have got the right question paper.

N.B

- i) All questions are compulsory.
- ii) Figures to the right indicate full marks.
- iii) Calculator is allowed.

Q.1(A) Attempt any one:

- (a) Prove that the sum of the squares of the deviations of all the values taken about their arithmetic mean is minimum. 08
- (b) State and prove the formula for mode in case of continuous frequency distribution. 08

(B) Attempt any one:

- (c) Find the median for the following distribution: 07

Class	0-10	10-20	20-30	30-40	40-50
Frequency	14	25	27	24	15

- (d) Find mean and standard deviation of first 'n' natural members. 07

Q.2(A) Attempt any one:

- (a) Prove that the root mean square deviation is least when deviations are measured from the mean. 08
- (b) Define moments. Establish the relationship between moments about mean and the moments about any point. 08

(B) Attempt any one

- (c) Find, mean and standard deviation if the first three moments of a distribution about the value 5 of variable are 5, 20 and 40. 07
- (d) Calculate first and second moments about zero for the observations 3, 8, 11, 12, 20. 07

Q.3(A) Attempt any one:

(a) If A,B,C are pairwise independent and A is independent of BUC, then prove that A, B, C are 05
mutually independent.

(b) Prove that, for three observations x_1, x_2 and x_3 : 05
 $AH = G^2$

Where A = arithmetic mean,
H= harmonic mean,
G= geometric mean

(B) Attempt any one:

(c) Find the constant K for the probability density function 05
 $f(x) = K \cdot x^2, 0 \leq x \leq 3$
= 0, elsewhere
and compute $P(1 \leq x \leq 2)$.

(d) From a bag containing 5 white, 7 red, and 4 black balls, a man draws 3 at random. Find the 05
probability of being all white.

Q.4 Choose correct alternative of the following: 10

- (i) Which of the following is a continuous variable.
 - (a) The number of children's in a family.
 - (b) temperature
 - (c) The number of students in a class.
 - (d) The number of workers in a firm.

(ii) The mode of the distribution

x	10	20	30	40	50
f	4	5	7	6	3

is.....

- (a) 40 (b) 50 (c) 60 (d) 30
- (iii) The skewness of the distribution 4,4,5,5 is.....
 - (a) 0 (b) 1 (c) -1 (d) 2
- (iv) Total number of possible cases when three dice are thrown simultaneously is.....
 - (a) 36 (b) 81 (c) 216 (d) 253
- (v) The value of the variable which divides a series into two equal parts so that one half or more of the items are equal to or less than it is
 - (a) mode (b) median (c) mean (d) geometric mean

OR

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SUBJECT CODE NO:- B-2047
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-V) Examination OCT/NOV 2019
Mathematics 504 2) Ordinary Differential Equation –I

[Time: 1:30 Hours]

[Max. Marks:50]

N.B

Please check whether you have got the right question paper.

- i) All questions are compulsory.
- ii) Figures to the right indicate full marks.

Q.1(A) Attempt any one:

08

- (a) If r is a root of multiplicity m of a polynomial p , $\deg p \geq 1$, then prove that
 $p(r) = p'(r) = \dots = p^{(m-1)}(r) = 0$
 and $p^m(r) \neq 0$.

- (b) Consider the equation
 $y' + ay = b(x)$

08

Where a is a constant, and b is a continuous function on interval I , If x_0 is a point in I and C is any constant, then prove that the function ϕ defined by

$$\phi(x) = e^{-ax} \int_{x_0}^x e^{at} b(t) dt + ce^{-ax}$$

is a solution of this equation. Also prove that every solution has this form.

(B) Attempt any one:

07

- (c) If ϕ is solution of the differential equation

$$y' + iy = x$$

Such that $\phi(0) = 2$.
 Find $\phi(\Pi)$.

- (d) Find all roots of the polynomial
 $z^3 + 24$.

07

Q.2(A) Attempt any one:

- (a) For any real x_0 , and constants α, β , Prove that there exists a solution ϕ of the initial value problem

08

$$L(y) = y'' + a_1 y' + a_2 y = 0$$

$$y(x_0) = \alpha, y'(x_0) = \beta$$

on $-\infty < x < \infty$

- (b) Prove that two solutions ϕ_1, ϕ_2 of
 $L(y) = y'' + a_1y' + a_2y = 0$
 are linearly independent on an interval
 I if and only if,
 $W(\phi_1, \phi_2) \neq 0$
 For all x in I

08

(B) Attempt any one:

07

- (c) Find all solutions ϕ of the differential equation

$$y'' + y = 0$$

Satisfying

$$\phi(0) = 1, \phi(\pi/2) = 2$$

- (d) Find all solutions of the equation

$$y'' + 4y = \cos x$$

07

Q.3(A) Attempt any one:

05

- (a) If ϕ_1, ϕ_2 are solutions of

$$L(y) = y'' + a_1y' + a_2y = 0$$

on an interval I containing a point x_0 , then prove that

$$W(\phi_1, \phi_2)(x) = e^{-a_1(x-x_0)}W(\phi_1, \phi_2)(x_0)$$

- (b) If α, β are any two constants and x_0 is any real number. On any interval I containing x_0 ,
 prove that there exists at most one solution ϕ of the initial value problem

$$L(y) = y'' + a_1y' + a_2y = 0$$

$$y(x_0) = \alpha, y'(x_0) = \beta$$

05

(B) Attempt any one:

05

- (c) Consider the equation

$$y' + 5y = 2$$

- (i) Show that the function ϕ given by

$$\phi(x) = \frac{2}{5} + Ce^{-5x}$$

is solution, where C is constant.

- (ii) Assuming every solution has this form, find the solution satisfying

$$\phi(1) = 2.$$

- (d) Show that the functions:

$$\phi_1(x) = \cos x, \phi_2(x) = \sin x$$

are linearly independent for $-\infty < x < \infty$.

05

Q.4 Choose the correct alternative

10

- (1) Every polynomial of degree 3 with real coefficient has at least.....
 - (a) Two real roots
 - (b) one real root
 - (c) Three real roots
 - (d) None of these
- (2) The function ϕ is called solution of $y' = f(x, y)$, where $x, y \in S$, if
 - (a) $\phi(x)$ is in S
 - (b) $\phi'(x) = f(x, \phi(x))$
 - (c) both (a) and (b)
 - (d) None of these
- (3) The functions ϕ_1, ϕ_2 defined by $\phi_1(x) = x$ and $\phi_2(x) = |x|$ are.....
 - (a) Linearly independent
 - (b) Linearly dependent
 - (c) Both (a) and (b)
 - (d) None of these
- (4) Let b be continuous on an interval I . Every solution Ψ of $L(y) = y'' + a_1y' + a_2y = b(x)$ on I can be written as $\Psi = C_1\phi_1 + C_2\phi_2 + \Psi_p$ then Ψ_p is known as
 - (a) Complementary function
 - (b) Basic solution
 - (c) Particular solution
 - (d) None of these
- (5) The solution ϕ of $y' + ay = 0$ is given by.....
 - (a) $\phi(x) = ce^{-ax}$
 - (b) $\phi(x) = ce^{ax}$
 - (c) $\phi(x) = e^{ax}$
 - (d) None of these

OR

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SUBJECT CODE NO:- B-2047
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem-V) Examination OCT/NOV 2019
Mathematics 505 3) Programming in C - I

[Time: 1:30 Minutes]

[Max. Marks:40]

Please check whether you have got the right question paper.

N.B

- i) All questions are compulsory.
- ii) Assume the data wherever not given with justification.
- iii) Figures to the right indicate full marks.

Q.1(A) Attempt any one:

05

- (a) Write the rules to define a symbolic constant in # define statement.
- (b) Explain structure of C programs.

(B) Attempt any one:

05

- (c) Write a C program for storage classes.
- (d) Write a C program to calculate the average of a set of N numbers.

Q.2(A) Attempt any one:

05

- (a) Discuss relational operators in C language with example.
- (b) Explain arithmetic operators and integer operators.

(B) Attempt any one:

05

- (c) Write a program to compute Salesman's salary with suitable data.
- (d) Write a program to solve the quadratic equation
 $ax^2 + bx + c = 0$.

Q.3(A) Attempt any one:

05

- (a) Explain the uses of following functions
 - (i) islower
 - (ii) toupper
 - (iii) tolower
- (b) Explain mixed data output using printf function

(B) Attempt any one:

05

- (c) Write a program for the function % () specification.
- (d) Write a program to detect errors in scanf input.

Q.4 Fill in the blanks and write the complete sentence.

10

- (a) A # define is a..... Compiler and not a
- (b) Identifiers must not contain
- (c) The logical operator && means
- (d) Thefunction requires a set of parentheses.
- (e) % [] is used to read strings withspaces.