

Total No. of Printed Pages:2

SUBJECT CODE NO:- B-2187
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem.-VI) Examination OCT/NOV 2019
Mathematics MAT

1) Mathematical Statistics-II – 603

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- N.B
1. All questions are compulsory
 2. Figures to the right indicate full marks

Q.1 A) Attempt any one 08

- 1) Let X_1, X_2, \dots, X_n be n random variables then prove that:

$$V[\sum_{i=1}^n a_i X_i] = \sum_{i=1}^n a_i^2 V(X_i) + 2 \sum_{i=1}^n \sum_{j=1}^n a_i a_j Cov(X_i, X_j) \quad i < j$$
- 2) If X and Y are independent random variables then prove that:

$$E(h(x) \cdot K(Y)) = E(h(x)) \cdot E(K(Y)).$$

where h(x) is a function of X alone

And K(Y) is a function of Y alone, provided expectations on both sides exist.

B) Attempt any one 07

- 3) Starting from the origin, unit steps are taken to the right with probability p and to the left with probability q (q=1-p) Assuming independent movements, find the mean and variance of the distance moved from origin after n steps.

Q.2 A) Attempt any one: 08

- 1) Find the first four moments of Binomial distribution by using recurrence relation.
- 2) Prove that Poisson distribution is a limiting case of Binomial distribution.

B) Attempt any one 07

- 3) If 'm' things are distributed among a men and b women . show that the probability that the numbers of things received by men is odd ,is

$$\frac{1}{2} \left[\frac{(b+a)^m - (b-a)^m}{(b+a)^m} \right]$$

- 4) In a book of 520 pages 390 typographical errors occur. Assuming poisson Law for the number of errors per page, find a probability that a sample of 5 pages will contain no error.

- Q.3 A) Attempt any one 05
 1) Define exponential distribution and hence find variance of exponential distribution
 2) Find the median of normal distribution.
- B) Attempt any one 05
 3) If X has a Uniform distribution in [0,1], find the distribution (p.d.f) of $-2\log X$. Identify the distribution also.
 4) If X and Y are independent Poisson variates with means λ_1 and λ_2 respectively, find the probability that $X + Y = K$

- Q.4 Choose the correct alternative and rewrite the sentence. 10
- 1) $\text{Var}(2X \pm 3) = \dots\dots\dots$
 a) 6 b) 5 c) -1 d) 4, if $\text{var}(x)=1$
- 2) Ten coins are thrown simultaneously then probability of getting exact 7 heads is -----
 a) 1/1024 b) 1/512 c) 15/128 d) 1/256
- 3) The first moment (about origin) of geometric mean is -----
 a) q/p b) p/q c) 1/pq d) pq
- 4) Moment generating function of normal distribution is -----
 a) $e^{\left(\mu t + \frac{t^2 \sigma^2}{2}\right)}$ b) $e^{\left(\mu t - \frac{\sigma^2 t^2}{2}\right)}$ c) $e^{-\left(\mu t + \frac{t^2 \sigma^2}{2}\right)}$ d) $e^{-\left(\mu t - \frac{t^2 \sigma^2}{2}\right)}$
- 5) Moment generating function of rectangular distribution is -----
 a) $\frac{e^{bt} + e^{at}}{t(b-a)}$ b) $\frac{e^{bt} - e^{at}}{t(b-a)}$ c) $\frac{e^{bt} - e^{at}}{t(b+a)}$ d) $\frac{e^{bt} + e^{at}}{t(b+a)}$

OR

Total No. of Printed Pages:02

SUBJECT CODE NO:- B-2187
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem.-VI) Examination OCT/NOV 2019
Mathematics MAT

2) Ordinary Differential Equation-II - 604

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- N.B
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.

Q.1 A) Attempt any one:- 08

a) Let $\Phi_1, \Phi_2, \dots, \Phi_n$ be the n solutions of $L[y] = y^{(n)} + a_1(x)y^{(n-1)} + \dots + a_n(x)y = 0$ on I satisfying

$$\Phi_i^{(i-1)}(x_0) = 1, \Phi_i^{(j-1)}(x_0) = 0, \quad j \neq i$$

If Φ is any solution of $L[y]=0$ on I then prove that there exists n constants C_1, C_2, \dots, C_n such that $\Phi = c_1\Phi_1 + c_2\Phi_2 + \dots + c_n\Phi_n$.

b) If Φ_1 is a solution of $L[y]=y''+a_1(x)y'+a_2(x)y = 0$ on an interval I and $\Phi_1(x) \neq 0$ on I, a second solution Φ_2 of $L[y]=0$ on I is given by

$$\Phi_2(x) = \Phi_1(x) \int_{x_0}^x \frac{1}{[\Phi_1(s)]^2} \exp \left[- \int_{x_0}^x a_1(t) dt \right] ds$$

Prove that the functions Φ_1, Φ_2 form a basis for the solutions of $L[y] = 0$ on I.

B) Attempt any one:- 07

c) Show that $\Phi(x) = x^r$ is constant is a solution of the equation $y'' + \frac{1}{x}y' - \frac{1}{x^2}y = 0$ for $x > 0$. Find two linearly independent solutions for $x > 0$ and prove that they are linearly independent.

d) Show that $\Phi_1(x) = x$, ($0 < x < 1$) is a solution of $(1 - x^2)y'' - 2xy' + 2y = 0$ and find a second independent solution.

Q.2 A) Attempt any one:- 08

a) Prove that, with usual notations $\Psi_p(x) = \sum_{K=1}^n \Phi_K(x) \int_{x_0}^x \frac{W_K(t)b(t)}{W(t)} dt$ is a particular solution of

$$L[y] = y^{(n)} + a_1(x)y^{(n-1)} + \dots + a_n(x)y = b(x)$$

b) Obtain the Bessel function of zero order of the first kind. Does it converge? Justify.

B) Attempt any one:- 07

c) Show that

$$\int_{-1}^1 P_n(x)P_m(x)dx = 0, n \neq m$$

- d) Find all solutions of the equation $2x^2y'' + xy' - y = 0$ for $x > 0$

Q.3 A) Attempt any one:-

05

- a) Prove that the function $\Phi_2(x) = \sum_{k=0}^{\infty} c_k x^k + (\log x)\Phi_1(x)$, ($c_0 = 0$) where $\Phi_1(x) = J_0(x)$ is a solution of the Bessel equation of order α .
- b) Prove that a basis for solution of the Euler equation on any interval not containing $x=0$ is $\Phi_1(x) = |x|^{r_1}$, $\Phi_2(x) = |x|^{r_2}$ if $r_1 \neq r_2$

B) Attempt any one:-

05

- c) Show that $J_{\alpha-1}(x) - J_{\alpha+1}(x) = 2J_{\alpha}'(x)$
- d) Find all solutions of $3x^2y'' + 5xy' + 3xy = 0$

Q.4 Choose the correct alternative and rewrite the sentence:-

10

- 1) The equation $(x - 1)^2y'' + 2xy' - 8y = 0$ has a singular point.
a) 0 b) 1 c) -1 d) 2
- 2) The value of the integral $\int_{-1}^1 P_5^2(x)dx$ is
a) $\frac{2}{11}$ b) $\frac{11}{2}$ c) $\frac{2}{5}$ d) $\frac{5}{2}$
- 3) The value of the Wronskian of $\Phi_1(x) = x^2, \Phi_2(x) = x^3, x \neq 0$ is
a) $3x^2$ b) x^2 c) x^4 d) $4x^3$
- 4) The number of linearly independent solutions of the equation $x^3y'' + x^2y' + 3xy' + 4y = 0$ is
a) 1 b) 2 c) 3 d) 4
- 5) If $W' + a_1(x)W = 0$ then $W(x)$ is given by
a) $W(x) = 0$ b) $W(x) \neq 0$ c) $W(x) = e^{cx}$ d) $W(x) = ce^{-\int_{x_0}^x a_1(t)dt}$

OR

Total No. of Printed Pages:01

SUBJECT CODE NO:- B-2187
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. T.Y (Sem.-VI) Examination OCT/NOV 2019
Mathematics MAT
3) Programming in C-II-605

[Time: 1:30 Hours]

[Max.Marks:40]

Please check whether you have got the right question paper.

- N.B
1. All questions are compulsory.
 2. Assume the data whenever not given with justification
 3. Figures to the right indicate full marks.
- Q.1
- A) Attempt any one: 05
- a) Explain how decision making is done using if statement.
 - b) State dangling else problem? How to resolve it?
- B) Attempt any one 05
- c) Write a program to determine range of values and average cost of a personal computer.
 - d) Explain rules for switch statement.
- Q.2
- A) Attempt any one 05
- a) Explain do statement in detail with example.
 - b) Discuss how to skip a part of the body of the loop under certain conditions.
- B) Attempt any one 05
- c) Write a program to evaluate $y = x^n$
Where n is a non-negative integer.
 - d) Write a program to calculate the sum of squares of all integers between 1 and 15.
- Q.3
- A) Attempt any one 05
- a) Write a short note on data structures.
 - b) Discuss in detail searching and sorting.
- B) Attempt any one 05
- c) Write a C program to evaluate standard deviation of given data (Assume the data)
 - d) Write a program for initializing large arrays when runtime is at 1.0.
- Q.4 Fill in the blanks: 10
- a) If the test expression is true, the statement –block will be _____ executed.
 - b) A counter- controlled loop is called _____.
 - c) The general form of array declaration is _____.
 - d) The _____ operator is a combination of ? and _____
 - e) Switch is a multiway _____ statement.