2020
MATHEMATICS – HONOURS
SEMESTER-5
INTERNAL ASSESSMENT
Full Marks of each Course: 10

The figures in the margin indicate full marks .
Symbols and notations used here carry their usual meaning.
Candidates are required to give their answers in their own words as far as practical.

Course: CC11 (Probability & Statistics)

Answer all the questions with proper justification: 5x2=10

1. $E_1, E_2, \ldots, E_n$ are n independent events such that $P(E_i) = \dfrac{1}{2i+1}$ for $1 \le i \le n$. The chance that none

    of $E_1, E_2, \ldots, E_n$ occurs is

    (a) $\dfrac{1}{(n+1)!}$

    (b) $2^n \dfrac{n!}{(2n+1)!}$

    (c) $2^{2n} \dfrac{(n!)^2}{(2n+1)!}$

    (d) $2^n \dfrac{(n!)^2}{(2n+1)!}$

2. The mean of the random variable X with probability mass function given by

    $f(x) = kq^x$, x=0, 1, 2,...(0<q<1) is

    (a) q

    (b) $q(1-q)$

    (c) $\dfrac{q}{1-q}$

    (d) $\dfrac{q}{(1-q)^2}$

3. If X be a random variable and $E(X^2) = a$, then an upper bound of $P(|X| \ge a)$ is

    (a) a

    (b) $\dfrac{1}{a}$

    (c) $\dfrac{1}{a^2}$

    (d) 0

4. The marks obtained by 18 students in an examination have a mean 56 and variance 65. 95% lower confidence limit for the man of the population of marks, assuming it to be normal is

    (a) 50.87

    (b) 51.87

    (c) 52.87

    (d) 53.87

    [Given, $t_{0.05,17} = 2.11$]

5. The regression lines of a bivariate sample are $x + 6y - 6 = 0$ and $3x + 2y - 10 = 0$. The correlation coefficient is

    (a) $-\dfrac{1}{6}$

    (b) $\dfrac{1}{6}$

    (c) $\dfrac{1}{3}$

    (d) $-\dfrac{1}{3}$

Course: CC12(Group Theory II & Linear Algebra II)

Answer all the questions with proper justification: 5x2=10

6. If G be an infinite cyclic group, then the group $Aut(G)$ is of order
    (a) 1 (b) 0 (c) 2 (d) infinite

7. The group Z (under addition) of all integers
    (a) Can be represented as an internal direct product of two subgroups of Z
    (b) Can be represented as an internal direct product of three subgroups of Z
    (c) Can be represented as an internal direct product of finite number of subgroups of Z
    (d) Can not be represented as an internal direct product of two subgroups of Z

8. Let G be a group such that Z(G)={e}. Then |Z(Aut(G))| is
    (a) 1 (b) 2 (c) 0 (d) none of these

9. Let α be an eigen value of a linear operator T on V. If $T^* = T^{-1}$. Then
    (a) $\alpha = 1$ (b) $|\alpha| = 1$ (c) $|\alpha| = 0$ (d) none of these

10. Let φ be a linear functional on R^2 such that $\varphi(2,1) = 15$, $\varphi(1,-2) = -10$. Then the value of $\varphi(-2,7)$ is
    (a) 5 (b) 20 (c) 41 (d) 49

Course: DSE-A1(Advanced Algeb

Answer all the questions with proper justification: 5x2=10

11. Which one is true?
 a. A commutative ring without unity is a skew field.
 b. A non-commutative ring without unity is a field.
 c. A simple non-commutative ring without unity may not be a skew field.
 d. A commutative ring with unity is a skew field.

12. The number of Sylow 5-groups in A_5 is
  a. 6   b. 5   c. 12   d. 1

13. Which one is not true?
 a. If F is a field then F[x] is a field.
 b. If F is a UFD then F[x] is a UFD.
 c. If F is a PID then F[x] is a PID.
 d. None of these.

14. Which one is UFD but not PID
 a. $\mathbb{Z}$ b. $\mathbb{Z}_n$ c. $\mathbb{Z}[i]$ d. None of these.

15. The order of a non-abelian group which is not simple will be
  a. 60   b. 168   c.660   d.54

Course: DSE-B2 (LPP & Game Theory)

Answer all the questions with proper justification: 5x2=10

16. In Graphical Method of LPP if the cost line coincide with a side of the region of basic feasible solutions we get
    a) Unique optimum solution   b) Unbounded optimum solution
    c) No feasible solution   d) Infinite number of optimum solution

17. If the value of the objective function z can be increased or decreased indefinitely, such solution is called
    a) Bounded Solution   b) Alternative optimal solution
    c) Unbounded solution   d) None of these

18. The Area of feasible region of the following constraints x+3y≥3 , x≥0, y≥0   is
    a) Bounded   b) Unbounded   c) Convex   d) concave

19. Which of the following methods is not used to find an Initial Feasible Solution in a Transportation Problem
    a) North-West Corner Method   b) Matrix Minima Method
    c) VAM   d) Hungarian Method

20. A Convex Polyhedron is the set of all convex combinations of
    a) An infinite number of points   b) Finite number of points
    b) Exactly 8 points   d) None of these