

Applied Mathematics(XI)

Code No. (241)

Session – 2021-22

Annual Examination March/April, 2022

Max Marks - 40

No.	Units	Marks
II	Algebra (Continued)	04
IV	Calculus a) * Functions 4.1, 4.2, 4.3, 4.4 (02) b) 4.5, 4.6, 4.7, 4.8 (04)	06
V	Probability	08
VI	* Descriptive Statistics	06
VII	Basic of Financial Mathematics	11
VIII	Coordinate Geometry	05
	Total	40
	Internal Assessment	10
	Total	50

* Topics from Term –I

Sl. No.	Contents	Learning Outcomes: Students will be able to	Notes / Explanation
Permutations and Combinations			
2.15	Factorial	<ul style="list-style-type: none"> Define factorial of a number Calculate factorial of a number 	<ul style="list-style-type: none"> Definition of factorial: $n! = n(n-1)(n-2)\dots 3.2.1$ Usage of factorial in counting principles
2.16	Fundamental Principle of Counting	<ul style="list-style-type: none"> Appreciate how to count without counting 	<ul style="list-style-type: none"> Fundamental Principle of Addition Fundamental Principle of Multiplication
2.17	Permutations	<ul style="list-style-type: none"> Define permutation Apply the concept of permutation to solve simple problems 	<ul style="list-style-type: none"> Permutation as arrangement of objects in a definite order taken some or all at a time Theorems under different conditions resulting in ${}^n P_r = \frac{n!}{(n-r)!}$ or n^r or $\frac{n!}{n_1!n_2!\dots n_k!}$ arrangements
2.20	Combinations	<ul style="list-style-type: none"> Define combination Differentiate between permutation and combination Apply the formula of combination to solve the related problems 	<ul style="list-style-type: none"> -The number of combinations of n different objects taken r at a time is given by ${}^n C_r = \frac{n!}{r!(n-r)!}$ Some results on combinations: <ul style="list-style-type: none"> ${}^n C_0 = 1 = {}^n C_n$ ${}^n C_a = {}^n C_b \Rightarrow a=b$ or $a+b=n$ ${}^n C_r = {}^n C_{n-r}$ ${}^n C_r + {}^n C_{r-1} = {}^{n+1} C_r$

UNIT – 4 CALCULUS

4.1	Functions	<ul style="list-style-type: none"> • Identify dependent and independent variables • Define a function using dependent and independent variable 	<ul style="list-style-type: none"> • Dependent variable and independent variable • Function as a rule or law that defines a relationship between one variable (the independent variable) and another variable (the dependent variable)
4.2	Domain and Range of a function	<ul style="list-style-type: none"> • Define domain, range and co-domain of a given function 	<ul style="list-style-type: none"> • Domain as a set of all values of independent variable • Co-domain as a set of all values of dependent variable • Range of a function as set of all possible resulting values of dependent variable
4.3	Types of functions	<ul style="list-style-type: none"> • Define various types of functions • Identify domain, co-domain and range of the function 	<ul style="list-style-type: none"> • Following types of functions with definitions and characteristics Constant function, Identity function, Polynomial function, Rational function, Logarithm function, Exponential function, Modulus function, Greatest integer function, Signum function, Algebraic function
4.5	Concepts of limits and continuity of a function	<ul style="list-style-type: none"> • Define limit of a function • Solve problems based on the algebra of limits • Define continuity of a function 	<ul style="list-style-type: none"> • Left hand limit, Right hand limit, Limit of a function, Continuity of a function
4.6	Instantaneous rate of change	<ul style="list-style-type: none"> • Define instantaneous rate of change 	<ul style="list-style-type: none"> • The ratio $\frac{\Delta y}{\Delta x} = \frac{f(x+\Delta x)-f(x)}{\Delta x}$ as instantaneous rate of change, where Δy is change in y and Δx is change in x at any instant
4.7	Differentiation as a process of finding derivative	<ul style="list-style-type: none"> • Find the derivative of the functions 	<ul style="list-style-type: none"> • Derivatives of functions (non-trigonometric only)
4.8	Derivatives of algebraic functions using Chain Rule	<ul style="list-style-type: none"> • Find the derivative of function of a function 	<ul style="list-style-type: none"> • If $y = f(u)$ where $u = g(x)$ then differential coefficient of y w.r.t x is $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

UNIT – 5 PROBABILITY

5.1	Introduction	<ul style="list-style-type: none"> • Appreciate the use of probability in daily life situations 	<ul style="list-style-type: none"> • Probability as quantitative measure of uncertainty • Use of probability in determining the insurance premium, weather forecasts etc.
5.2	Random experiment and sample space	<ul style="list-style-type: none"> • Define random experiment and sample space with suitable examples 	<ul style="list-style-type: none"> • Sample space as set of all possible outcomes
5.3	Event	<ul style="list-style-type: none"> • Define an event • Recognize and differentiate different types of events and find their probabilities 	<ul style="list-style-type: none"> • Types of Event: Impossible and sure event, Independent and dependent event, mutually exclusive and exhaustive event
5.4	Conditional Probability	<ul style="list-style-type: none"> • Define the concept of conditional probability • Apply reasoning skills to solve problems based on conditional probability 	<ul style="list-style-type: none"> • Conditional Probability of event E given that F has occurred is: $P(E F) = \frac{P(E \cap F)}{P(F)}, P(F) \neq 0$
5.5	Total Probability	<ul style="list-style-type: none"> • Interpret mathematical information and identify situations when to apply total probability • Solve problems based on application of total probability 	<ul style="list-style-type: none"> • Total Probability: Let E_1, E_2, \dots, E_n be a partition of the sample space S, then probability of an event A associated with S is: $P(A) = \sum_{j=1}^n P(E_j)P(A E_j)$
5.6	Bayes' Theorem	<ul style="list-style-type: none"> • State Bayes' theorem • Solve practical problems based on Bayes' Theorem 	<ul style="list-style-type: none"> • Bayes' Theorem: If E_1, E_2, \dots, E_n be n non empty events which constitute a partition of a sample space S and A be any event with non zero probability, then: $P(E_i A) = \frac{P(E_i)P(A E_i)}{\sum_{j=1}^n P(E_j)P(A E_j)}$

UNIT- 6 DESCRIPTIVE STATISTICS

6.4	Data Interpretation		
	Measure of Dispersion	<ul style="list-style-type: none">• Understand meaning of dispersion in a data set• Differentiate between range, quartile deviation, mean deviation and standard deviation• Calculate range, quartile deviation, mean deviation and standard deviation for ungrouped and grouped data set• Choose appropriate measure of dispersion to calculate spread of data	<ul style="list-style-type: none">• Mean deviation around mean and median• Standard deviation and variance• Examples of different kinds of data helping students to choose and compare different measures of dispersion
	Skewness and Kurtosis	<ul style="list-style-type: none">• Define Skewness and Kurtosis using graphical representation of a data set• Interpret Skewness and Kurtosis of a frequency distribution by plotting the graph• Calculate coefficient of Skewness and interpret the results	<ul style="list-style-type: none">• Examples of symmetrical and asymmetrical data• Visualization of graphical representation of data using Excel Spreadsheet or any other computer assisted tool
6.5	Percentile rank and Quartile rank	<ul style="list-style-type: none">• Define Percentile rank and Quartile rank• Calculate and interpret Percentile and Quartile rank of scores in a given data set	<ul style="list-style-type: none">• Emphasis on visualizing, analysing and interpreting percentile and quartile rank scores
6.6	Correlation	<ul style="list-style-type: none">• Define correlation in values of two data sets• Calculate Product moment correlation for ungrouped and grouped data• Calculate Karl Pearson's coefficient of correlation• Calculate Spearman's rank correlation• Interpret the coefficient of correlation	<ul style="list-style-type: none">• Emphasis on application, analysis and interpreting the results of coefficient of correlation using practical examples

UNIT – 7 FINANCIAL MATHEMATICS

7.1	Interest and Interest Rates	<ul style="list-style-type: none"> ● Define the concept of Interest Rates ● Compare the difference between Nominal Interest Rate, Effective Rate and Real Interest Rate ● Solve Practical applications of interest rate 	<ul style="list-style-type: none"> ● Impact of high interest rates and low interest rates on the business
7.2	Accumulation with simple and compound interest	<ul style="list-style-type: none"> ● Interpret the concept of simple and compound interest ● Calculate Simple Interest and Compound Interest 	<ul style="list-style-type: none"> ● Meaning and significance of simple and compound interest ● Compound interest rates applications on various financial products
7.3	Simple and compound interest rates with equivalency	<ul style="list-style-type: none"> ● Explain the meaning, nature and concept of equivalency ● Analyze various examples for understanding annual equivalency rate 	<ul style="list-style-type: none"> ● Concept of Equivalency ● Annual Equivalency Rate
7.4	Effective rate of interest	<ul style="list-style-type: none"> ● Define with examples the concept of effective rate of interest 	<ul style="list-style-type: none"> ● Effective Annual Interest Rate = $(1 + i/n)^n - 1$ where: i = Nominal Interest Rate n = No. of Periods
7.5	Present value, net present value and future value	<ul style="list-style-type: none"> ● Interpret the concept of compounding and discounting along with practical applications ● Compute net present value ● Apply net present value in capital budgeting decisions 	<ul style="list-style-type: none"> ● Formula for Present Value: $PV = CF/(1 + r)^n$ Where: CF = Cash Flow in Future Period r = Periodic Rate of return or Interest (also called the discount rate or the required rate of return) n = no. of periods ● Use of PVAF, FVAF tables for practical purposes ● Solve problems based on Application of net present value
7.6	Annuities, Calculating value of Regular Annuity	<ul style="list-style-type: none"> ● Explain the concept of Immediate Annuity, Annuity due and Deferred Annuity ● Calculate General Annuity 	<ul style="list-style-type: none"> ● Definition, Formulae and Examples

7.7	Simple applications of regular annuities (upto 3 period)	<ul style="list-style-type: none"> • Calculate the future value of regular annuity, annuity due • Apply the concept of Annuity in real life situations 	<ul style="list-style-type: none"> • Examples of regular annuity: Mortgage Payment, Car Loan Payments, Leases, Rent Payment, Insurance payouts etc.
7.8	Tax, calculation of tax, simple applications of tax calculation in Goods and service tax, Income Tax	<ul style="list-style-type: none"> • Explain fundamentals of taxation • Differentiate between Direct and indirect tax • Define and explain GST • Calculate GST • Explain rules under State Goods and Services Tax (SGST) Central Goods and Services Tax (CGST) and Union Territory Goods and Services Tax (UTGST) 	<ul style="list-style-type: none"> • Computation of income tax Add Income from Salary, house property, business or profession, capital gain, other sources, etc. Less deductions PF, PPF, LIC, Housing loan, FD, NSC etc. • Assess the Individuals under Income Tax Act • Formula for GST Different Tax heads under GST
7.9	Bills, tariff rates, fixed charge, surcharge, service charge	<ul style="list-style-type: none"> • Describe the meaning of bills and its various types • Analyze the meaning and rules determining tariff rates • Explain the concept of fixed charge 	<ul style="list-style-type: none"> • Tariff rates- its basis of determination • Concept of fixed charge service charge and their applications in various sectors of Indian economy
7.10	Calculation and interpretation of electricity bill, water supply bill and other supply bills	<ul style="list-style-type: none"> • To interpret and analyze electricity bills, water bills and other supply bills • Evaluate how to calculate units consumed under electricity bills/water bill 	<ul style="list-style-type: none"> • Components of electricity bill/water supply and other supply bills: <ul style="list-style-type: none"> i) overcharging of electricity ii) water supply bills iii) units consumed in electricity bills
UNIT – 8 COORDINATE GEOMETRY			
8.1	Straight line	<ul style="list-style-type: none"> • Find the slope and equation of line in various form • Find angle between the two lines • Find the perpendicular from a given point on a line • Find the distance between two parallel lines 	<ul style="list-style-type: none"> • Gradient of a line • Equation of line: Parallel to axes, point-slope form, two-points form, slope intercept form, intercept form • Application of the straight line in demand curve related to economics problems

8.2	Circle	<ul style="list-style-type: none"> ● Define a circle ● Find different form of equations of a circle ● Solve problems based on applications of circle 	<ul style="list-style-type: none"> ● Circle as a locus of a point in a plane ● Equation of a circle in standard form, central form, diameter form and general form
8.3	Parabola	<ul style="list-style-type: none"> ● Define parabola and related terms ● Define eccentricity of a parabola ● Derive the equation of parabola 	<ul style="list-style-type: none"> ● Parabola as a locus of a point in a plane. ● Equation of a parabola in standard form: ● Focus, Directrix, Axis, Latus rectum, Eccentricity

Internal Assessment:

The weightage of internal assessment may be as under:

Term	Area and Weightage	Assessment Area	Marks allocated
Term 2	Practical	Performance of practical and record	5
		Term-end test of any one practical + Viva	5
Total			10

Note: Internal Assessment will be carried out under the school arrangements.