To

The Director
Centre for Distance and Online Education
Himachal Pradesh University, Shimla

Subject: Assignments of**B.A. (Mathematics) Third year**- submission thereof.

Madam,

Kindly find enclosed the assignments of **B.A. (Mathematics) 3rd year** for the **session 2020-21 (January Batch)** for further transmission to the students by uploading on the website.

Sincerely yours.

Dated: 20/09/2023

Aarti
20/09/2023.

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ASSIGNMENTS-I

(For BA-3rd Year Session 2020-21 January Batch)

BA-Third Year **Course Code: MATH 303 TH**

Course Title: Linear Algebra

Attempt any FOUR of the following:

1. Prove that any field forms a vector space over itself.
2. Show that $U_1 = \{(a, b, c, d): b + c + d = 0\}$is a subspace of R^4.
3. Prove that the linear span $L(s)$ of any subset S of a vector space $V(f)$ is subspace of $V(F)$.
4. If u, v, w are linearly independent vectors in vector space $V(F)$, then show that $u + v, u - v, u - 2v + w$ are linearly independent.
5. If W is a subspace of a finite dimensional vector space $V(F)$, prove that $\dim W \leq \dim V$.
6. Extend $B = \{(1,1,1,1), (1,2,1,2)\}$ to a basis of $R^4(R)$.

ASSIGNMENTS-II

(For BA-3rd Year Session 2020-21 January Batch)

BA-Third Year **Course Code: MATH 303 TH**

Course Title: Linear Algebra

Attempt any **FOUR** of the following:

1. Show that $T: R^2 \to R^3$ defined by $T(x, y) = (x + y,\ x - y,\ y)$ is a linear transformation.
2. Let $T: V_3(R) \to V_3(R)$ defined by

   $T(x, y, z) = (3x, x - y, 2x + y + z)$.

   Prove that T is invertible and find T^{-1}.
3. Find the basis of $B = (V_1, V_2)$ of R^2 over R, where $V_1 = (1, 2)$, $V_2 = (1, 5)$.
4. Find the eigen values and eigen vectors of

$$\begin{bmatrix} 1 & i \\ 0 & i \end{bmatrix}$$

5. Diagonalize the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix}$.
6. Find characteristic polynomial for

$$\begin{bmatrix} 5 & -2 \\ 8 & 3 \end{bmatrix}.$$

ASSIGNMENTS-I

(For B.A. 3rd year session 2020-21 January Batch)

B.A.-Third Year **Course Code: MATH304TH**

Course Title: Numerical Methods

Attempt any **FOUR** of the following:

1. Find the iterative formula for finding $\frac{1}{\sqrt{N}}$ for some positive real number N. Hence find the value of $\frac{1}{\sqrt{15}}$ correct up to three decimal places.
2. Solve the system of equation by Gauss elimination method

$$\left.\begin{aligned} x + 4y - z &= -5 \\ x + y - 6z &= -12 \\ 3x - y - z &= 4 \end{aligned}\right\}$$

3. Find $y(2.5)$, if the function f(x) is given as

x	0	1	2	3
f(x)	0	2	8	27

4. Using Stirling's formula find y_{35} given that $y_{20} = 512, y_{30} = 439, y_{40} = 346, y_{50} = 243$.
5. Fit a polynomial of degree 2 for the given data

x	0	1	2
y	1	6	17

6. Find the first and second derivatives of $y = f(x), at\ x = 0$ given that:

x	0	1	2	3	4	5
f(x)	4	8	15	7	6	2

ASSIGNMENTS-II

(For B.A. 3rd year session 2020-21 January Batch)

B.A.-Third Year **Course Code: MATH304TH**

Course Title: Numerical Methods

Attempt any **FOUR** of the following:

1. Calculate $\int_0^4 \sqrt{64 - x^3}\ dx$ by Trapezoidal rule using 9 ordinates.
2. Evaluate $\int_0^{\frac{\pi}{2}} e^{sinx}\ dx$ by Simpson's1/3 rule taking n=4.
3. Using Simpson's 3/8 rule, evaluate $\int_1^2 (x^3 + 1)\ dx$ and compare the result analytically solving the integral. Comment on the difference in result.
4. Solve the equation $\frac{dy}{dx} = 1 - y$, with the initial condition $x = 0, y = 0$, using Eules's algorithm and tabulate the solutions $x = 0.1, 0.2, 0.3$.

Given $\frac{dy}{dx} = xy$, with $y(1) = 5$. Find the solution correct to three decimal places in

5. the interval (1,1.5] using Runge-Kutta second order method.
6. Apply Runge-Kutta fourth order method with $h = 0.2$ to estimate $y(0.4)$ when $\frac{dy}{dx} = x^2 + y^2$with $y(0) = 0$.

ASSIGNMENTS-I

(For BA-3rd Year Session 2020-21 January Batch)

BA-Third Year **Course Code: MATH 313 TH**

Course Title: Probability and Statistics

Attempt any **FOUR** of the following:

Qn. 1: If $P(A) = p$, $P(B) = q$, then show that

$$P(A|B) = \frac{p+q-1}{q}$$

Qn. 2: The probabilities of X, Y and Z becoming managers are $\frac{4}{9}, \frac{2}{9}$ and $\frac{1}{3}$ respectively. The probabilities that the bonus scheme will be introduced if X, Y and Z becomes managers are $\frac{3}{10}, \frac{1}{2}$ and $\frac{4}{5}$ respectively.

(i) What is the probability that Bonus scheme will be introduced, and

(ii) If the Bonus scheme has been introduced, what is the probability that the manager appointed was X?

Qn. 3: Suppose that the p.d.f. of a random variable X is as follows:

$$f(x) = \begin{cases} cx \; for \; 0 < x < 4 \\ 0 \quad elsewhere \end{cases}$$

where c is a given constant. Determine the value of c and the values of $P(1 \leq X \leq 2)$ *and* $P(X > 2)$.

Qn. 4: Two unbiased dice are thrown. Find the expected value of the sum of numbers of points on them.

Qn. 5: Let X be a random variable with the following probability distribution:

x	-3	6	9
p(x)	1/6	1/2	1/3

Find $E(X)$ and $E(X^2)$ and using the laws of expectation, evaluate $E(2X+1)^2$.

Qn. 6: Find the characteristics function of the random variable X having density function given by

$$f(x) = \begin{cases} \frac{1}{2}\, a, & |x| < a \\ 0, & elsewhere \end{cases}$$

1.

ASSIGNMENTS-II

(For BA-3rd Year Session 2020-21 January Batch)

BA-Third Year **Course Code: MATH 313 TH**

Course Title: Probability and Statistics

Attempt any **FOUR** of the following:

Qn. 1: From a lot containing 20 items, five of which are defective, four items are drawn with replacement. What is the probability of getting

(a) Exactly one defective item?
(b) Atleast one defective item?

Qn. 2: A book has 200 pages and 200 misprints distributed at random. What is the probability that a page contains

(a) Exactly two misprints
(b) Fewer than two misprints? $(e^{-1} = 0.09195)$

Qn. 3: In a distribution, exactly normal, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution?

Qn. 4: The joint probability distribution of a pairs of random variables is given by

Y \ X	0	1	2
-1	0.1	0.1	0.2
0	0.2	0.1	0.1
1	0.1	0.1	0.0

Find (a) The marginal distribution of X and Y.

(b) The conditional distribution of X given Y = 0.

Qn. 5. Let random variables X_1 , X_2 have the joint probability density function

$$f(x_1, x_2) = \begin{cases} 12x_1x_2(1-x_2), & 0 < x_1 < 1,\ 0 < x_2 < 1 \\ 0, & elsewhere \end{cases}$$

Show that the random variables are independent.

Qn. 6: Let X_1 , X_2 have the joint probability density function

$$f(x_1, x_2) = \begin{cases} 6X_2, & 0 < X_2 < X_1 < 1 \\ 0, & elsewhere \end{cases}$$

Find

(a) The marginal probability density function of X_1
(b) The conditional probability density function of X_2 given $X_1 = X_2$.

ASSIGNMENTS-I

(For B.A. 3rd year session 2020-21 January Batch)

B.A. -Third Year **Course Code: MATH317TH**

Course Title: Transportation and Game Theory

Attempt any **FOUR** of the following:

1. Find IFS of the following transportation problem with the help of North West Corner method

Warehouses-Factories	A	B	C	Capacity
X	11	21	16	14
Y	7	17	13	26
Z	11	23	21	36
Requirement	18	28	25	

2. Find the IFS of the following transportation problem using Least Cost Entry method

Warehouses-Factories	A	B	C	D	Capacity
X	30	25	40	20	100
Y	29	26	35	40	250
Z	31	33	37	30	150
Requirement	90	160	200	50	

3. Find the IFS of the following transportation problem using VAM

Warehouses-Factories	A	B	C	Capacity
X	50	30	220	1
Y	90	45	170	3
Z	50	200	50	4
Requirement	3	3	2	

4. Find the optimum solution of given transportation problem using VAM

Warehouses-Factories	A	B	C	Capacity
X	11	20	22	1500
Y	21	10	11	1050
Z	32	24	15	900
Requirement	1500	1500	500	3500

5. Write a detailed note on Transportation problem along with its mathematical formulation.
6. Define the following terms: Feasible solution, Basic feasible solution, optimum solution, balanced transportation problem, unbalanced transportation problem, Degenerate basic feasible solution, non-degenerate basic feasible solution.

ASSIGNMENTS-II

(For B.A. 3rd year session 2020-21 January Batch)

B.A.-Third Year **Course Code: MATH317TH**

Course Title: Transportation and Game Theory

Attempt any **FOUR** of the following:

1. Write a detailed note on Assignment problem along with its mathematical formulation. What is Hungarian method to solve transportation problem.
2. Solve the given assignment problem

Warehouses-Factories	I	II	III	IV
A	16	52	34	22
B	26	56	8	52
C	76	38	36	30
D	38	52	48	20

3. Solve the minimum assignment problem using Hungarian method.

	I	II	III	IV	V
1	10	5	9	18	11
2	13	9	6	12	14
3	3	2	4	4	5
4	18	9	12	17	15
5	11	6	14	19	10

4. Define the following terms: game, player, fair game, two person zero sum game, n person game, non-zero sum game, strategy, pure and mixed strategy, optimum strategy, pay off, pay off matrix.
5. Solve the given game by using the dominance property

	I	II	III	IV	V
1	1	3	2	7	4
2	3	4	1	5	6
3	6	5	7	6	5
4	2	0	6	3	1

6. Solve the game graphically

Player A/B	I	II	III	V
I	1	4	-2	-3
II	2	1	4	5