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Bansilal Ramnath Agarwal Charitable Trust’s  
**VISHWAKARMA INSTITUTE OF TECHNOLOGY, PUNE – 411037.**  
( An Autonomous Institute Affiliated to Savitribai Phule Pune University)

**Examination: ESE**

Year: F.Y. B. Tech

Subject: Mathematics and Statistics

Max. Marks: 60

Day & Date:

Branch: All

Subject Code: ES 1043

Total Pages of Question Paper:

Time:

**Instructions to Candidate**

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right indicate full marks.

Q. N.	CO No	BT* No		Max marks
<b>Q.1(A)</b>			<b>Attempt any Two</b> ( 2 questions from Vector Space and 1 System of Linear Equations <b>OR</b> 1 questions from Vector Space and 2 System of Linear Equations)	
<b>a</b>	1/2	2,3, 4	System of Linear Equations / Vector Space	<b>03</b>
<b>b</b>	1/2	2,3, 4	System of Linear Equations / Vector Space	<b>03</b>
<b>c</b>	1/2		System of Linear Equations / Vector Space	<b>03</b>
<b>Q.1(B)</b>	1,2	1,2, 3,4	Vector Space / Linear Transformation	<b>04</b>
<b>Q.2(A)</b>			<b>Attempt any Two</b> ( 2 questions from Vector Space and 1 Linear Transformation)	
<b>a</b>	1/2	1,2, 3,4	Vector Space / Linear Transformation	<b>03</b>
<b>b</b>	1/2	1,2, 3,4	Vector Space / Linear Transformation	<b>03</b>
<b>c</b>	1/2	1,2, 3,4	Vector Space / Linear Transformation	<b>03</b>
<b>Q.2(B)</b>	2	1,2, 3,4	Vector Space	<b>04</b>
<b>Q.3(A)</b>			<b>Attempt the following</b>	
	2,3	4,5,6	Linear Transformation / Eigen Values and Eigen Vectors (Definition / Properties)	<b>04</b>
<b>Q.3(B)</b>			<b>Attempt any One</b>	
<b>a</b>	3	2,4,5	Eigen Values and Eigen Vectors (Properties / Diagonalization)	<b>06</b>
<b>b</b>	3	2,4,5	Eigen Values and Eigen Vectors(Properties / Diagonalization)	<b>06</b>
<b>Q.4(A)</b>			<b>Attempt the following</b>	
<b>a</b>	4	2,3,5	Partial Differentiation	<b>04</b>
<b>b</b>	4	1,23,5	Partial Differentiation	<b>04</b>
<b>Q.4(B)</b>	4	2,3,4,5, 6	Extreme values of functions of two variables	<b>06</b>
<b>Q. 5.</b>			<b>Attempt the following</b>	<b>10</b>
<b>a</b>	5	1,2,3,4, 5	Differential Equations	<b>05</b>
<b>b</b>	5	1,2,3,4, 5	Differential Equations	<b>05</b>
<b>OR</b> There will be small question based on Complementary solution/ Wronskian / Roots of Auxiliary equation / Construction of Homogeneous Equation with marks combination ( <b>3+3+4</b> )				
<b>Q. 6.</b>			<b>Do as directed</b>	<b>10</b>
<b>a</b>	6	2,3,4,6	Descriptive Statistics	<b>05</b>
<b>b</b>	6	2,3,4,6	Random Variables	<b>05</b>
<b>OR</b> There will be small question based on Descriptive Statistics like categories of variable, Measures of Central Tendency / Measures of Dispersion / Histogram/Box Plot / Properties of Random Variable with marks combination + Visualization of data with Histogram / Box Plot + Random Variable (pmf, cdf) ( <b>3+3+4 OR 2+2+2+4 OR 2+3+5</b> )				

**CO Statements:**  
CO1: *solve the system of linear equations and analyze vector spaces, linear transformation.*  
CO2: *recognize the concepts of spanning set, basis, dimension, linear dependence/independence, matrix of linear transformation*  
CO3: *find eigen values and eigen vectors*  
CO4: *demonstrate the knowledge of partial derivatives and its applications*  
CO5: *solve linear differential equations and interpret the solution*  
CO6: *represent, visualize and analyze statistical data*

**\*Blooms Taxonomy (BT) Level No:**  
1. Remembering; 2. Understanding; 3. Applying; 4. Analyzing; 5. Evaluating; 6. Creating