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Q.P. Code – 15631

Sixth Semester B.Sc. Degree Examinations, OCTOBER/NOVEMBER 2018

(Semester Scheme) (New Syllabus – 2014-15 onwards)

(SSF 530) Paper VII – MATHEMATICS

Time : 3 Hours] *[Max. Marks : 80*

Note *: Answer* ***ALL*** *questions.*

I. Answer any TEN of the following : 10 × 2 = 20 marks

1. In a vector space V(F), prove that $C\alpha = \bar{o} \Rightarrow either\ C = 0\ or\ \alpha = \bar{o}$.

2. Prove that the subset $W = \{(x, y, z) / \sqrt{2}\,x = \sqrt{3}\,y\}$ of the vector space $V_3(R)$ is a subspace of $V_3(R)$.

3. For what value of 'K', the vectors (-4, -3, -2), (-1, K, 1) and (2, 3, 4) are linearly dependent.

4. If $T : V \to W$ is a linear transformation, then show that

   $T(0) = 0^1\ when\ 0 = zero\ vector\ of\ V \quad and\ 0^1 = zero\ vector\ of\ W$

5. Find the matrix of the linear transformation,

   $T : V_2(R) \to V_3(R) defined\ by\ T(x, y) = (x - 2y, 2x, x - 3y)$

6. In an Euclidean vector space, prove that $|\alpha - \beta| \le |\alpha| - |\beta|$

7. Prove that the inter section of two convex sets is also a convex set.

8. Draw the graph and find the solution set for the inequality $-1 \le y \le 2\ in\ R$.

9. Define Degenerate solution of LPP.

10. If $P = \{0, {}^1/_3, {}^2/_3, 1\}$ is a partition of [0, 1], find

    $U(p, f)$ and $L(p, f)$ for the function of $f(x) = x$.

11. State Darboux theorem.

12. Prove that the lower Reimann integral cannot exceed the upper Reimann integral.

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II. Answer any THREE of the following : 3 × 5 = 15 marks

1. Prove that the intersection of two subspaces of a vector space is again a subspace and give an example to show "The Union of two subspaces of a vector space is need not be a subspace".

2. Express the polynomial $V = 5x^2 - 9x - 5$ as a linear combination of the polynomials $V_1 = 4x^2 + x + 2,\ V_2 = 3x^2 - x - 1,\ V_3 = 5x^2 - 2x + 3$.

3. In $V_3(Z_3)$ how many vectors are spanned by (2, 1, 1) and (1, 2, 2).

4. Prove that the set $\{\alpha_1, \alpha_2, - - - - \alpha_n\}$ of non zero vectors is linearly dependent iff some vector α_k is a linear combination of its preceding vectors.

5. Find the basis and dimesion of the subspace spanned by $S = \{(1,1,1), (2,1,2), (1,0,1), (5,3,5)\}\ in\ V_3(R)$.

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III. Answer any THREE of the following : 3 × 5 = 15 marks

1. Show that the transformation $T: V_2(R) \to V_2(R)$ defind by $T(x, y) = (x\,cos\theta - y\,sin\theta, x\,sin\theta + y\,cos\theta$. Is linear.

2. Given $A = \begin{pmatrix} 1 & -1 & 2 \\ 3 & 1 & 0 \end{pmatrix}$. Find the linear transformation $T: V_3(R) \to V_2(R)$ relative to the bases $B_1 = \{(1,1,1), (1,2,3), (1,0,0)\}$ & $B_2 = \{(1,1), (1,-1)\}$.

3. If $T: V \to W$ is a linear transformations, then prove that T is one - one iff $N(T) = \{0\}$ where 0 is zero vector of V. https://www.kuvempuonline.com

4. State and prove Rank – Nullity theorem.

5. Apply Gram – Schmidt process to orthonormalize the basis {(1, 0, 0), (1, 1, 1), (1, 2, 3)}.

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IV. Answer any THREE of the following : 3 × 5 = 15 marks

1. Show that the set $S = \{(x_1, x_2) \mid 9x_1^2 - 4x_2^2 \leq 36\}$ is a convex set

2. Find the basic and basic feasible solution for the system, $x_1 - x_2 + 2x_3 = 9, \quad 3x_1 - 2x_2 - 5x_3 = 22$

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3. Two food stuff A and B have three vitamins V_1, V_2 and V_3 as follows.

Food Stuff	V_1 (mg)	V_2 (mg)	V_3 (mg)
A	1	100	10
B	1	10	100

Minimum daily requirement of these vitamins are 1 mg, 50 mg and 10 mg respectively. If the cost of food stuff A is Rs 2 and that of B is Rs 3, find the minimum cost of diet that would supply the body at least minimum requirements of each vitamin by graphical method.

4. Max; $Z = 2x - 3y$

Sub to $x - y \leq 30$

$x - y \geq 0$

$y \geq 3$

$0 \leq x \leq 20$

$0 \leq y \leq 12$ by using graphical method.

5. Max; $f = 4x - 2y - z$

Sub to $x - y - z \leq 3$

$2x + 2y - z \leq 4$

$x - y \leq 0$

$x, y, z \geq 0$ by using simplex method.

V. Answer any THREE of the following : **3 × 5 = 15 marks**

1. If P^* is the refinement of P then prove that $U(P^*, f) \leq U(P, f)$

2. Show that $f(x) = 3x + 1$ is R-integrable over [1, 2] and hence deduce $\int_1^2 f(x)dx = \frac{11}{2}$

3. Prove that every continuous function is R-integrable.

4. If $f(x) = e^x$, compute $\int_0^1 f(x)dx$ by using integration as limit of sum.

5. Show that $f(x) = (-1)^{r-1}$ where $\frac{1}{r-1} \leq x \leq \frac{1}{r}, r = 1, 2 - - -$ is R-integrable over [0,1] and $\int_0^1 f(x)dx = log4 - 1$.

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