P P SAVANI UNIVERSITY

First Semester of B. Tech. Examination

January 2022

SESH1080 Linear Algebra & Calculus

24.01.2022, Monday **Time: 12:30 p.m. To 03:00 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in same answer sheet.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

Q – 1 Write all the properties of Vector addition. **[06]**

Q – 2 Check vectors $(1,-2,1), (2,1,-1), (7,-4,1)$ are Linearly dependent or Independent. **[06]**

Q – 3 Let $T: R^3 \to R^3$ be the projection of a vector v into the xy −plane that is, $T(x,y,z) = (x,y,0)$. Find kernel and Range. **[09]**

Q – 4 Find a QR −decomposition of $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ **[09]**

OR

Q – 4 Apply the Gram-Schmidt orthogonalization process to find an orthogonal basis and then an orthonormal basis for the subspace U of R^4 spanned by $(1,-2,1), (2,1,-1), (7,-4,1)$. **[09]**

SECTION – II

Q – 1 If $f(x,y) = y\cos x + xe^y$, find the second order derivatives $\frac{\partial^2 f}{\partial x^2}$, $\frac{\partial^2 f}{\partial y \partial x}$, $\frac{\partial^2 f}{\partial y^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$. **[06]**

Q – 2 Find the tangent plane and normal line of the level surface at point (2,1,4). Where function is $f(x,y,z) = x^2 + y^2 + z - 9 = 0$. **[05]**

Q – 3 Evaluate $\int_0^a \frac{1}{(a^n - x^n)^{\frac{1}{n}}} dx = \pi/\mathrm{n} \sin\left(\frac{\pi}{n}\right)$. **[09]**

OR

Q – 3 Evaluate $\int_0^{\frac{\pi}{2}} \tan^n \theta \, d\theta = \frac{1}{2}\pi \sec\left(\frac{1}{2}n\pi\right)$. **[09]**

Q – 4 Trace the hypocycloid $x = a\cos^3 t, y = b\sin^3 t$. **[10]**

OR

Q – 4 Trace the cardioid $r = a(1 + \cos\theta.)$ **[10]**

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