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Sardar Patel University

B.Sc. (semester-III) Examination Sept.-2022

Paper Code: US03CELC01 **Paper Title: electronics and Communication**

Date: 22/09/2022; Thursday **Time: 12:30 pm to 02:30 pm**

Maximum Marks: 70

Q.1 Multiple Choice Questions **[10]**

(1) A quantity which is completely specified by its magnitude is called _____.

(a) Vector (b) Scalar (c) Sphere (d) tensor

(2) Curl F is a which quantity?

(a) Vector (b) scalar (c) tensor (d) None

(3) If F is solenoid, the $\nabla \cdot \vec{F}$ = _____ .

(a) Zero (b) One (c) Infinity (d) None

(4) Curl (grad ϕ) = _____.

(a) Zero (b) One (c) Infinity (d) None

(5) Sin $n\pi$ = _____.

(a) -n (b) 0 (c) 1 (d) $(-1)^n$

(6) Laplace transform of Sinat _____.

(a) $\frac{1}{s-a}$ (b) $\frac{a}{s-a}$ (c) $\frac{a}{s^2+a^2}$ (d) $\frac{K}{S}$

(7) Fourier transform is also called as _____.

(a) Differential (b) Arithmetic (c) Integral (d) Algrebic

(8) Even function is symmetrical about _____.

(a) origin (b) x-axis (c) y-axis (d) Origin

(9) Odd function is symmetrical about _____.

(a) origin (b) x-axis (c) y-axis (d) Origin

(10) If integrand contains cosλx as a factor or if the function f(x) is even then _____.

(a) Cosine transform (b) sine transform (c) General transform (d) None

Q.2 **Do as directed.(Fill in the blanks)** **[08]**

(1) A quantity which is completely specified by its magnitude and direction is called _____. (vector, Tensor)

(2) $\vec{A} \times \vec{B} =$ _____ (ABcosθ , ABsinθ)

(3) _____ gives the relation between volume integral and surface integral. (Gauss theorem, Stoke theorem)

(4) Laplace transform of cosat _____. $(\frac{a}{s^2+a^2}, \frac{a}{s+a})$

(5) Laplace transform of e^{at} _____. $(\frac{a}{s^2+a^2}, \frac{1}{s-a})$

(6) If _____ is not midpoint of the interval for a function f(x), then such a function can neither be even nor be odd. (zero, one)

(7) Is the function $f(x) = x^3 + 2x$ an _____ function (odd , even)

(8) Laplace transform of 1 is _____. $(\frac{1}{s}, 1)$

Q.3 **Answer the short questions.(Any Ten)** **[20]**

(1) Explain unit vector.

(2) State stoke's theorem.

(3) Give the properties of reciprocal vector.

(4) Define: surface integral.

(5) State the properties of Fourier series.

(6) Write down the complete formula for finding Fourier series of function f(x).

(7) Find the Laplace transforms of tsinhat.

(8) Find the Laplace transforms of sin2t.cos3t.

(9) Find the Laplace transforms of t^2cosat.

(10) Find the Laplace transforms of e^{at}.

(11) Explain Fourier transform for even function.

(12) Give the definition of Fourier transform.

Q.4 **Attempt any four.** **[32]**

(1) Find the scalar and vector product of the vectors $\vec{A}$ and $\vec{B}$ where $\vec{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = 4\hat{i} + 2\hat{j} - 3\hat{k}$ .Also find the angle between $\vec{A}$ and $\vec{B}$.

(2) State and explain Green's theorem with complete notation.

(3) Find the Fourier series for $f(x) = \sinh ax$ in $(-\pi, \pi)$

(4) Find the Fourier series for $f(x) = 0$, $-\pi \leq x \leq 0$.
$= x$, $0 \leq x \leq \pi$

(5) Obtain the Laplace Transform of following functions.
(a) $\cos^2 t$
(b) $\sin^3 2t$

(6) Obtain the Laplace Transform of $\frac{1-\cos t}{t^2}$ functions.

(7) Find the Fourier Sine Transform of $\frac{e^{ax}}{x}$ and hence evaluate $\int \tan^{-1}\frac{x}{a} \sin x \, dx$.

(8) (a) Find the Fourier Sine Transform of $f(x) = e^{-2x} + e^{-3x}$, $x > 0$.

(b) Find the Fourier Cosine Transform of the function $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$.

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