[43/A-18]

Seat No__ No. of printed pages. 02

SARDAR PATEL UNIVERSITY
S.Y.B.Sc (Semester-III) EXAMINATION
27th November 2018, Tuesday
02:00 pm to 05:00 pm
US03CELC01: ELECTRONICS & COMMUNICATION

Total Marks: 70

Note: The figures to the right indicate maximum marks

Q-1 Multiple Choice Question. **[10]**

i. Velocity is rate of change of
[a] Speed [b] Distance
[c] Acceleration [d] None

ii. Even function is symmetrical about ____ and odd function is symmetrical about _____.
[a] 3,0 [b] 0,3
[c] -3,0 [d] 0,-3

iii. $\frac{\pi^2}{8} =$ _____.
[a] $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots$ [b] $\frac{1}{2^2}+\frac{1}{4^2}+\frac{1}{6^2}+\ldots\ldots$
[c] $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\ldots$ [d] None

iv. Sin $n\pi$ = _____.
[a] 0 [b] -n
[c] 1 [d] $(-1)^n$

v. The numerical value of $\Gamma\,{}^3/_2$ is _____.
[a] $\sqrt{\pi}/2$ [b] $\sqrt{3\pi}/2$
[c] $\sqrt{\pi}$ [d] 0

vi. The Laplace transform of $e^{at}\,t^n$ is _____.
[a] $\frac{n!}{(s+a)^{n+1}}$ [b] $\frac{n!}{s^{n+1}}$
[c] $\frac{n!}{(s-a)^{n+1}}$ [d] $\frac{n!}{s^{n-1}}$

vii. Fourier transform is also called _____ transform.
[a] arithmetic [b] differential
[c] integral [d] None

viii. Fourier cosine transform is given by _____
[a] $F_c(\lambda) = \int_{-\infty}^{\infty} f(u)\, sin\lambda u\, du.$ [b] $F_c(\lambda) = \int_0^{\infty} f(u)\, sin\lambda u\, du.$
[c] $F_c(\lambda) = \int_0^{\infty} f(u)\, cos\lambda u\, du.$ [d] $F_c(\lambda) = \int_{-\infty}^{\infty} f(u)\, cos\lambda u\, du.$

ix. L[sinat]=_____
[a] $\frac{1}{s+a}$ [b] $\frac{1}{s-1}$
[c] $\frac{1}{s-a}$ [d] None

x. The del operated on the scalar function gives _____.
[a] Gradient [b] Curl
[c] Divergence [d] None

(P.T.O)

Q-2 **Answer in short (Any Ten)** [20]

i. Define: Divergence.

ii. What is rotational motion?

iii. Find the Fourier series co-efficient a_0 for f(x) =cosh ax in $(-\pi,\pi)$, a>0.

iv. Find the Laplace transform of: $\sin^3 2t$.

v. State the Fourier transform of odd function.

vi. Find Laplace transform of: $1 + 2\sqrt{t} + \frac{3}{\sqrt{t}}$.

vii. Write the formula for finding Fourier integral transform of general transform.

viii. If $f(x) = \frac{1}{2}(\pi - x)$ in the interval $(0,2\pi)$. Find the value of b_n.

ix. Find the Fourier sine transform of $f(x) = \frac{1}{x}$.

x. Find the Laplace transform of: $\cosh at - \cos at$.

xi. Define: Curl.

xii. Give the expressions for a_0, a_n & b_n.

Q-3 (a) If $\vec{F} = 3xy\,i - y^2\,j$. Evaluate $\int \vec{F} \cdot \overrightarrow{dR}$ where C is the curve in xy plane $y = 2x^2$ from (0,0) to (1,2). [07]

(b) If A =4i+3j+k and B=2i-j+2k, then find A.B and AxB. [03]

OR

Q-3 A particle moves along the curve , $x = t^3 + 1$, $y = t^2$, $z = 2t + 3$, where t denotes the time. Find the component of velocity and acceleration at $t = 1$ in the direction $i - 3j + 2k$. [10]

Q-4 (a) Find Fourier series for $f(x) = e^{-ax}$ in the range $(-\pi, \pi)$, k=0. [07]

(b) Express f(x) = x/2 as a Fourier series in the interval $-\pi < x < \pi$. [03]

OR

Q-4 Find the Fourier series for, $f(x) = -\pi \quad -\pi \le x \le 0$
$= x \quad 0 \le x \le \pi$ [10]

Q-5 (a) Find the Laplace transform of the following functions : $t^2 \sin 5t$. [05]

(b) Find the Laplace transform of the following functions : $e^{4t} \sin 2t \cdot \cos t$. [05]

OR

Q-5 Find the Laplace transform of the following functions: [10]

(i) $e^t sint.cost$ (ii) $\frac{cos2t - cos3t}{t}$

Q-6 Using fourier integral representation, show that [10]

$\int_0^\infty \frac{\lambda^3 \sin \lambda x}{\lambda^4 + 4} d\lambda = \frac{\pi}{2} e^{-x} \cos x$,where $x > 0$

OR

Q-6 Find the fourier integral representation for [10]

$f(x) = 1 - x^2$,if $|x| \le 1$
$= 0$,if $|x| \ge 1$

Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3} \cos \frac{x}{2}$

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