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[27 & A-18]

SARDAR PATEL UNIVERSITY

B. Sc. III Semester

Thursday, Date: 1/12/2016

Electronics and Communication

Session Time: 2:00 to 5:00 pm

Course Code: | U | S | 0 | 3 | C | E | L | C | 0 | 1 |

Subject Title: Electronics and Communication

Total Marks: 70

Q-1 Multiple choice questions **10**

1. Curl F is
   (i) Scalar quantity
   (ii) Vector quantity
   (iii) Tensor quantity
   (iv) None of the above

2. Gradient is
   (i) A vector normal to the surface
   (ii) A vector parallel to surface
   (iii) Both (i) and (ii)
   (iv) None of the above

3. Velocity is rate of change of
   (i) Distance
   (ii) Speed
   (iii) Acceleration
   (iv) motion

4. The fourier series for f(x) in the interval $\alpha < x < \alpha + 2\pi$ is given by

   $(i)\quad f(x) = \frac{a_o}{2} + \sum_{n=0}^{\infty} a_n \cos nx + \sum_{n=0}^{\infty} b_n \sin nx$

   $(ii)\ f(x) = a_0 + \sum_{n=0}^{\infty} a_n \cos nx + \sum_{n=0}^{\infty} b_n \sin nx$

   $(iii)\ f(x) = \frac{a_o}{2} + \sum_{n=0}^{\infty} a_n \sin nx + \sum_{n=0}^{\infty} b_n \cos nx$

   (iv) *None of the above*

5. Sin n π =

(P.T.O.)

(i) $-n$
(ii) $(-1)^n$
(iii) 0
(iv) 1

6. Even function is symmetrical about
   (i) X-axis
   (ii) Y- axis
   (iii) Origin
   (iv) None of the above

7. Laplace transform of sinat =
   (i) s/s^2+a^2
   (ii) a/s^2+a^2
   (iii) s/s^2-a^2
   (iv) a/s^2+a^2

8. The numerical value of $\Gamma 3/2$ is
   (i) $\sqrt{\pi}$
   (ii) $\sqrt{\pi}/2$
   (iii) 1
   (iv) 0

9. $F(s) = \int_{-\infty}^{+\infty} f(t)e^{ist}dt$ is called
   (i) Fourier transform
   (ii) Laplace's transform
   (iii) Inverse Fourier transform
   (iv) None of above

10. $e^{i\Theta} + e^{-i\Theta} =$
   (i) $2i\sin\Theta$
   (ii) $2i\cos\Theta$
   (iii) $2i\tan\Theta$
   (iv) $2i\sec\Theta$

Q-2 Answer any **ten** questions in brief. **20**

1. Give geometrical interpretation of DOT product
2. State divergence theorem.

3. Find a_0 for the Fourier series to represent x^2 in the interval $(-\pi$ to $\pi)$
4. Define Incompressible fluid
5. Differentiate even and odd functions giving example.
6. Give expressions for a_o, a_n and b_n for a Fourier series.
7. Give expression for Laplace transform of sinhat and coshat
8. Find Laplace transform of $\cos^2 2t$
9. Find Laplace transform of $t - \sinh 2t$
10. Define Inverse Fourier Transform
11. Give expression for Fourier Cosine transform of the function f(x).
12. Define Fourier Transform

Q-3 A. A= 4i + 3j +6k, B = 2i –5j + 2k then find $\vec{A} \bullet \vec{B}$ and $\vec{A} X \vec{B}$ 5

B. A particle moves along the curve $\vec{R} = (t^3 - 4t)i + (t^2 + 4t)j + (8t^2 - 3t^3)k$, where t denotes time. Find component of velocity and acceleration at time t=2 in the direction i+2j+3k. 5

OR

Q-3 Evaluate div $\vec{F}$ and curl $\vec{F}$ at a point (1, 2, 3) for 10

(i) $\vec{F} = grad[x^3 y + y^3 z + z^3 x - x^2 y^2 z^2]$.

(ii) $\vec{F} = x^2 y\ zi + xy^2 zj + xyz^2 k$

Q-4 Find the fourier series expansion of $f(x) = e^{-ax}$ in the interval $0 < x < 2\pi$. 10

OR

Q-4 Find the fourier series expansion for f(x) if

$f(x) = -\pi$ $: -\pi < x < 0$,

$= x$ $; 0 < x < \pi$

Deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} \ldots$ 10

Q-5 Find Laplace Transform of 10

(i) $\sin^3 2t$

(ii) $t \sin^2 2t$

OR

Q-5 Find Laplace Transform of 10

(i) sin2tsin5t

(ii) $t^2 \sin 5t$

(P. T. O.)

Q-6 Find the fourier transform of $f(x)=\begin{cases}1 & for \quad |x|<1\\ 0 & for \quad |x|>1\end{cases}$ 10

Further, evaluate $\int_0^\infty \frac{Sinx}{x}dx$

OR

Q-6 Find the fourier transform $f(x)=\begin{cases}1-x^2 & for \quad |x|\le 1\\ 0 & for \quad |x|>1\end{cases}$ of 10

Hence evaluate $\int_0^\infty \frac{xCosx-Sinx}{x^3}Cos\frac{x}{2}dx$

********** BEST OF LUCK **********