SEAT No._____ No. of Printed Pages : 03

[691]

Sardar Patel University
Electronics and Communication
US03CELC01

Wednesday, 6-01-2021
2:00 pm to 4:00 noon
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 del operated on
   (i) Scaler quantity (ii) Vector quantity
   (iii) Tensor quantity (iv) None of the above

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

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

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

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

   (iv) None of the above

4. Sin nπ =
   (i) –n (ii) $(-1)^n$
   (iii) 0 (iv) 1

5. Even function is symmetrical about
   (i) X-axis (ii) Y- axis
   (iii) Origin (iv) Both (i) and (ii)

6. The laplace transform of e^{at}sinbt
   (i) $1/(s-a)^2 + b^2$ (ii) $b/(s-a)^2 + b^2$
   (iii) $a/(s-a)^2 + b^2$ (iv) $ab/(s-a)^2 + b^2$

7. The Laplace transform of $e^{at}t^n$ is given by

(i) $\frac{n!}{S^{n+1}}$ (ii) $\frac{n!}{(S-a)^{n+1}}$

(iii) $\frac{\Gamma(n+1)}{S^{n+1}}$ (iv) None of the above

8. The Laplace transform of $e^{at}\cos bt$

(i) $1/(s-a)^2+b^2$ (ii) $b/(s-a)^2+b^2$

(iii) $a/(s-a)^2+b^2$ (iv) $ab/(s-a)^2+b^2$

9. $e^{i\Theta}-e^{-i\Theta}=$

(i) $2i\cos\Theta$ (ii) $2i\sin\Theta$

(iii) $2i\tan\Theta$ (iv) None of the above

10. $e^{i\Theta}+e^{-i\Theta}=$

(i) $2i\cos\Theta$ (ii) $2i\sin\Theta$

(iii) $2i\tan\Theta$ (iv) $2i\cot\Theta$

(04)

Q2: Fill in the blanks.

1. $\underset{\sim}{A}\bullet\underset{\sim}{B}=$ ----------.
2. For odd function _____will vanish.
3. The numerical value of $\Gamma 3/2$ is = ----------.
4. $F(s)=\int_{-\infty}^{+\infty} f(t)e^{ist}dt$ is called ----------.

(04)

Q2: True or False.

1. $\underset{\sim}{A}X\underset{\sim}{B}=AB\cos\vartheta$
2. For even function a_0 will vanish
3. The laplace transform of e^{at} is 1/s-a.
4. $F(s)=\frac{1}{2\pi}\int_{-\infty}^{+\infty} f(s)e^{-isx}ds$ is called inverse Fourier Transform.

(20)

Q.3 Answer any <u>ten</u> questions briefly.

1. Give geometrical interpretation of DOT product.
2. Give geometrical interpretation of CROSS product.
3. Define Incompressible fluid and Compressible Fluid.
4. Give expressions for a_o, a_n and b_n.
5. Find a_0 for the Fourier series to represent x^2 in the interval ($-\pi$ to π)
6. Differentiate even and odd functions.
7. Define Work.
8. Find Laplace transform of $1+2\sqrt{t}+\frac{3}{\sqrt{t}}$
9. Find Laplace transform of $(\sin t-\cos t)^2$.
10. Find Laplace transform of cos(at+b)

11. Give definition of Fourier Transform.

12. Give definition of Inverse Fourier Transform.

Q.4 Long Answer question. (Answer any 4 out of 8) 32

1a. If A= 4i + 3j +k

B = 2i –j + 2k then find $\vec{A} \bullet \vec{B}$ and $\vec{A} X \vec{B}$ (3)

1b. A particle moves along the curve, $x = 2t^2$, $y = t^2 - 4t$ and $z = 3t - 5$ where t denotes time.

Find the component of velocity and acceleration at t=1 in the direction i+j+3k. (5)

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

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

3. Find the fourier series expansion for f(x) if

f(x) = - π : - π < x< π ,

= x ; 0 < x < π

Deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2}\frac{1}{5^2} + \frac{1}{7^2} \ldots$

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

5. Find Laplace transform of (i) e^{-3t} Sin 5t Sin 3t (ii) t^2 Sin at

6. Find Laplace transform of (i) $t\, e^{2t}$Sin3t (ii) $\frac{Cosat - Cosbt}{t}$

7. Find the fourier transform of

$$f(x) = \begin{cases} 1 & for \quad |x| < 1 \\ 0 & for \quad |x| > 1 \end{cases}$$

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

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

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

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