CODE No.: 16BT2BS01 SVEC-16

SREE VIDYANIKETHAN ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to JNTUA, Ananthapuramu)

I B.Tech II Semester (SVEC-16) Supplementary Examinations December - 2018

TRANSFORMATION TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS

[Civil Engineering, Electrical and Electronics Engineering, Mechanical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Electronics and Instrumentation Engineering, Information Technology, Computer Science and Systems Engineering]

Time: 3 hours **Max. Marks: 70**

Answer One Question from each Unit
All questions carry equal marks

UNIT-I

1 If $f(x) = \begin{cases} 0 , & -\pi \le x \le 0 \\ \sin x , & 0 \le x \le \pi \end{cases}$ then show that 14 Marks

$f(x) = \frac{1}{\pi} + \frac{\sin x}{2} - \frac{2}{\pi} \sum_{n=1}^{\infty} \frac{\cos 2nx}{4n^2 - 1}$, and hence establish that

$\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \ldots = \frac{1}{4}(\pi - 2)$.

(OR)

2 Write Fourier series of f(x) in the interval $(0, 2\ell)$ and develop the series for 14 Marks

$f(x) = 2x - x^2$ in $(0, 3)$ and hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots = \frac{\pi}{12}$.

UNIT-II

3 State Fourier sine transform of f(x) and develop a Fourier sine transform of 14 Marks

$e^{-|x|}$ and hence show that $\int_0^{\infty} \frac{x \sin mx}{1 + x^2} dx = \frac{\pi e^{-m}}{2}, m > 0$.

(OR)

4 State Fourier cosine transform of f(x). Find the Fourier cosine transform of 14 Marks

$f(x) = \frac{1}{1 + x^2}$ and applying it find Fourier sine transform of $\varphi(x) = \frac{x}{1 + x^2}$.

UNIT-III

5 Find the value of; 14 Marks

i) $L\left(\int_0^t t e^{-t} \sin 4t \, dt\right)$. (ii) $\int_0^{\infty} \frac{e^{-t} - e^{-2t}}{t} dt$.

(OR)

6 a) Find L (f(t)) where f(t)= $\begin{cases} \sin t, & 0 < t < \pi \\ 0, & \pi < t < 2\pi \end{cases}$. 7 Marks

b) Find: i) $L^{-1}\left(\frac{s-2}{s^2 - 5s + 6}\right)$. ii) $L^{-1}\left(\frac{1}{s(s+1)(s+2)}\right)$. 7 Marks

UNIT-IV

7 a) Calculate u_2 and u_3, if $U(z) = \frac{2z^2 + 4z + 12}{(z-1)^4}$. 7 Marks

b) Applying Z-transforms, solve $u_{n+2} + 2u_{n+1} + u_n = 0$, given that $u_0 = u_1 = 0$. 7 Marks

(OR)

8 a) State the convolution theorem and applying it find the inverse Z - transform of $\dfrac{z^2}{(z-4)(z-5)}$. 7 Marks

b) Find $Z^{-1}\left[\dfrac{z}{z^2+11z+24}\right]$ by using partial fractions method. 7 Marks

UNIT-V

9 a) Determine the partial differential equation by eliminating arbitrary constants **a**, **b** and **c** from $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}+\dfrac{z^2}{c^2}=1$. 7 Marks

b) By the technique of separation of variables, solve $y^3 z_x + x^2 z_y = 0$. 7 Marks

(OR)

10 Design a solution for the differential equation $\dfrac{\partial^2 u}{\partial x^2}=\dfrac{\partial u}{\partial y}+2u$ in the form $u = f(x)\, g(y)$ satisfying the conditions $u = 0$, $\dfrac{\partial u}{\partial x} = 1 + e^{-3y}$ when $x = 0$ for all values of y. 14 Marks

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