K. J. Somaiya College of Engineering, Mumbai-77
(A Constituent College Affiliated to SomaiyaVidyaviharUniversity)
Semester: **August – November 2020**
In-Semester Examination

Class: SY B. Tech
Branch: Computer Engineering **Semester :**III
Full name of the course: Integral Transform and Vector Calculus **Course Code:** 2UCC301
Duration: 1hr.15 min (attempting questions) +15 min (uploading) **Max. Marks:** 30

Q. No	Questions	Marks
Q1	Choose the correct option from the following MCQ (1 MARK EACH)	10 marks
1.1	Laplace transform of $t^4(sinhat + coshat)^n$ is (a) $\frac{24}{(s-an)^4}$ (b)$\frac{24}{(s+an)^4}$ (c)$\frac{24}{(s-a)^5}$ (d)$\frac{24}{(s+a)^4}$	
1.2	Find $L\left\{\int_0^t \text{u} \sinh 2u\, du\right\}$ (a)$\frac{-4}{(s^2-4)^2}$(b)$\frac{-4s}{(s^2-4)^2}$(c)$\frac{4}{(s^2-4)^2}$(d)$\frac{4s}{(s^2-4)^2}$	
1.3	Evaluate $\int_0^\infty \frac{\sin 3t}{t} dt$ (a)$\frac{1}{s}\left(\frac{\pi}{2} - \tan^{-1}\frac{s}{3}\right)$ (b) $\frac{\pi}{4}$(c)$\frac{\pi}{2} - \tan^{-1}\frac{s}{3}$ (d) $\frac{\pi}{2}$	
1.4	Find$L[t^2H(t-1)]$ (a)$e^s\left(\frac{2}{s^3} - \frac{2}{s^2} + \frac{1}{s}\right)(b)e^s\left(\frac{2}{s^3} + \frac{1}{s^2} + \frac{1}{s}\right)$ (c) $e^{-s}\left(\frac{2}{s^3} + \frac{2}{s^2} + \frac{1}{s}\right)(d)e^{-s}\left(\frac{2}{s^3} - \frac{2}{s^2} + \frac{1}{s}\right)$	
1.5	Find $L^{-1}\left(\frac{s^2}{s^2-16}\right)$ (a)$\delta(\text{t}) - 4\sinh 4t(b)\delta(\text{t}) + 4\sinh 4t$ (c) $1 - 4\sinh 4t$(d)$1 + 4\sinh 4t$	
1.6	Find $L^{-1}\left(\frac{s}{s^2+4s+13}\right)$ (a)$\cos(3t)e^{-2t} + \frac{2}{3}\sin(3t)\, e^{-2t}(b)\cos(3t)\, e^{-2t} - \frac{2}{3}\sin(3t)\, e^{-2t}$ (c) $\cos(3t)e^{2t} + \frac{2}{3}\sin(3t)\, e^{2t}(d)\cos(3t)\, e^{2t} - \frac{2}{3}\sin(3t)\, e^{2t}$	

1.7	If $x\sin x \;= -1 - \frac{1}{2}\cos x + \pi \sin x + \sum_{n=2}^{\infty} \frac{2\cos nx}{n^2-1}$ in $(0, 2\pi)$ For which value of x we get the following series $\sum_{n=2}^{\infty} \frac{1}{n^2-1} = \frac{3}{4}$ (a)0 (b) π (c)$\frac{\pi}{2}$(d)$\frac{\pi}{4}$	
1.8	For the function f(x) = $\lvert\sin x\rvert$ in$(-\pi, \pi)$ value of b_n is (a)$\frac{2}{\pi}$(b)0 (c)$\frac{1}{5\pi}$(d)$\frac{-4}{5\pi}$	
1.9	For the function f(x) = $\begin{cases} a - x & , 0 < x < a \\ 0 & , a < x < 2a \end{cases}$ value of a_2 is (a)0 (b)$\frac{a}{2\pi^2}$(c)$\frac{-a}{2\pi^2}$(d)$\frac{a}{\pi^2}$	
1.10	For the function f(x) = $\begin{cases} 2x & , 0 < x < 3 \\ 0 & , -3 < x < 0 \end{cases}$ value of b_3 is (a) 0 (b)$\frac{2}{\pi}$(c)$\frac{1}{3\pi}$(d)$\frac{-2}{\pi}$	
Q2	Attempt any **TWO** of the following	
(a)	Using convolution theorem find $L^{-1}\left(\frac{s^2}{(s^2+1)(s^2+4)}\right)$	5 marks
(b)	Using Laplace transform evaluate the integral $$\int_0^{\infty} e^{-2t}(1 + t + t^2)H(t-3)\,dt$$	5 marks
(c)	Find the Laplace transforms of $$\int_0^{t} u.e^{-3u} sin^2 udu$$	5 marks
Q3	Attempt any **ONE** of the following	
(a)	Obtain Fourier series for $f(x) = \begin{cases} \sin x, & 0 \le x \le \pi \\ 0, & \pi \le x \le 2\pi \end{cases}$ Hence, deduce that $\frac{1}{2} = \frac{1}{1\cdot3} + \frac{1}{3\cdot5} + \frac{1}{5\cdot7} + \ldots\ldots$	10 marks
(b)	Obtain the half – range **(i)** Cosine Series and **(ii)**sine series for $f(x) = lx - x^2$in $(0, l)$. Hence deduce that **(i)** $\frac{1}{1^6} + \frac{1}{3^6} + \frac{1}{5^6} + \frac{1}{7^6} + \ldots\ldots = \frac{\pi^6}{960}$ **(ii)**$\frac{1}{1^6} + \frac{1}{2^6} + \frac{1}{3^6} + \frac{1}{4^6} + \ldots\ldots = \frac{\pi^6}{945}$	10 marks