**K. J. Somaiya College of Engineering, Mumbai-77**
**(Autonomous College Affiliated to University of Mumbai)**

**End Semester Exam**
JULY 2021

**Max. Marks: 50**
**Duration: 1 hr 45 min + (15 min for uploading)**
**Class:** SY **Semester:** IV
**Name of the course:** ITVC **Course Code:** 2UCC301
**Branch:** Comp

**Instructions:**
1. **All questions are compulsory.**
2. **Draw neat diagrams.**
3. **Assume suitable data if necessary.**

| Q.No. | | Questions | Max Marks |
|---|---|---|---|
| Q:1 (A) | **Choose One correct Option for the following Questions** | | |
| | i) | $L\{\cos t \cos 2t \cos 3t\}$ at s=1 is<br>(a) 1.29 (b) 0.64 (c) 0.32 (d) 0.16 | 2 |
| | ii) | Parseval's identity for half range sine series for the function f(x) in $(0, c)$ is<br>(a) $\int_0^{2c}[f(x)]^2dx = c\left[\frac{a_0{}^2}{2} + \sum_{n=1}^{\infty}\left(a_n{}^2 + b_n{}^2\right)\right]$<br>(b) $\int_0^{c}[f(x)]^2dx = \frac{c}{2}\left[\frac{a_0{}^2}{2} + \sum_{n=1}^{\infty}(a_n{}^2)\right]$<br>(c) $\int_0^{2c}[f(x)]^2dx = \frac{c}{2}\left[\sum_{n=1}^{\infty}\left(a_n{}^2 + b_n{}^2\right)\right]$<br>(d) $\int_0^{c}[f(x)]^2dx = \frac{c}{2}\left[\sum_{n=1}^{\infty}\left(b_n{}^2\right)\right]$ | 2 |
| | iii) | Region of convergence for Z-transform of discrete unit step function is<br>(a) $\|z\| > 1$ (b) $\|z\| < 1$<br>(c) $\|z\| \neq 0$ (d) entire z-plane | 2 |
| | iv) | $If\ \bar{r} = x\hat{\imath} + y\hat{\jmath} + z\hat{k}\quad then\ \nabla \log(r)\ is$<br>$(a)\frac{\bar{r}}{r}$ $(b)\ \frac{\bar{r}}{r^2}$ $(c)\ f'(u)\frac{\bar{r}}{r^3}$ $(d) -\frac{\bar{r}}{r^3}$ | 2 |
| | v) | Which of the following expressions represents Stokes's Theorem-<br>(a) $\int_c Pdx + Qdy = \iint_R \left(\frac{\partial Q}{\partial x} - \frac{\partial P}{\partial y}\right)dxdy$<br>(b) $\oint \vec{F}.\overrightarrow{dr} = \int\int_S \text{curl}\ \vec{F}.\hat{n}ds$<br>(c) $\int\int_S \text{curl}\ \vec{F}.\hat{n}ds = \iiint_V div\ \vec{F}dV$<br>(d) $\int\int_S \vec{F}.\hat{n}ds = \iiint_V div\ \vec{F}dV$ | 2 |
| Q:**1(B)** | **Attempt any FIVE of the following.** | | |
| | i) | Find $L^{-1}\left(\frac{e^{-3s}}{(s+4)^3}\right)$ | 2 |
| | ii) | $If\ x\sin x = -1 - \frac{1}{2}\cos x + \pi\sin x + \sum_{n=2}^{\infty}\frac{2\cos nx}{n^2-1}$<br>$For\ which\ value\ of\ x\ we\ get\ the\ following\ series\ \sum_{n=2}^{\infty}\frac{1}{n^2-1} = \frac{3}{4}.$ | 2 |

| | | | |
|---|---|---|---|
| | iii) | If $Z[\sin \alpha k\}] = \frac{z \sin \alpha}{z^2 - 2z \cos \alpha + 1}$, $k \geq 0$ then find Z-transform of $c^k \sin \alpha k$, $k \geq 0$ | 2 |
| | iv) | Find curl of $\overline{F} = x^2 z\, i - 2y^3 z^3 j + xy^2 z^2 k$ at (1,-1,1) | 2 |
| | v) | If $\vec{A} = (3x^2 + 6y)\hat{\imath} - 14yz\hat{\jmath} + 20xz^2\hat{k}$, evaluate $\oint \vec{A}.\overrightarrow{dr}$ from (0,0,0) to (1,1,1) along the curve $x = t,\ y = t^2,\ z = t^3$ | 2 |
| | vi) | For the Fourier Series of the function $f(x) = \begin{cases} x & ,0 < x < 2 \\ 2\ , & -2 < x < 0 \end{cases}$ defined in (-2,2) then find value of $a_4$. | 2 |
| | vii) | If $L\{f(t)\} = \frac{\sqrt{3}/2}{s^2 + (\frac{3}{4})}$ find $L\{e^{t/2} f(t)\}$ | 2 |
| **Q:2** | A | Using Laplace Transforms, Solve the following Differential equation- $(D^2 + D)y = t^2 + 2t,\ y(0) = 4, y'(0) = -2$ | 6 |
| | B | Using Laplace Transforms, evaluate $\int_0^\infty (1 + 2t - 3t^2)\, H(t-2)$ dt | 4 |
| | | OR | |
| | | Find Inverse Transform of $\log(s^2 + 4)$ | 4 |
| **Q:3** | A | Find the Fourier expansion of $f(x) = 2x - x^2$ in the interval (0,3) and whose period is 3. | 6 |
| | B | Find Z-transform of $\left\{\left(\frac{1}{2}\right)^{\lvert k \rvert}\right\}$ and its Region of convergence. | 4 |
| | | OR | |
| | | Find Inverse Z-Transform of $\frac{1}{(z-5)^3}$ , $\lvert z \rvert > 5$. | 4 |
| **Q:4** | A | Find the values of $a, b, c$ if the directional derivative of $\phi = axy^2 + byz + cz^2x^3$ at (1,2,-1) has magnitude 64 in the direction parallel to the z –axis. | 6 |
| | B | Using Green's Theorem, find the work done in moving a particle once round the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ in the plane $z = 0$ in the force field given by $\vec{F} = (3x - 2y)\hat{\imath} + (2x + 3y)\hat{\jmath} + y^2\hat{k}$ . | 4 |
| | | OR | |
| | | If a vector field $\overline{F} = (y \sin z - \sin x)i + (x \sin z + 2yz)j + (xy \cos z + y^2)k$ is irrotational , find its scalar potential | 4 |