



Sanjay Ghodawat University, Kolhapur

2018-19

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

EXM/P/09/01

Year and Program: 2018-19

School of Technology

Department of Electrical & Electronics

SY B. Tech

Engg.

Course Code: EET 201

Course Title: Differential Calculus

Semester – III

and Transform Analysis

Day and Date: Tuesday

End Semester Examination (ESE)

Time: Max Marks: 100

04/06/2019

2.30 to 5.30 pm.

Instructions:

- 1) All questions are compulsory.
- 2) Assume suitable data wherever necessary.
- 3) Use of non-programmable calculator is allowed.

Q.1	Solve the following	Marks	Bloom's Level	CO
a)	Solve $(D^2 + 4D + 3)y = e^{-3x}$	07	L ₃	CO1
OR				
a)	Solve $(D^4 + 8D^2 + 16)y = \sin^2 x$	07	L ₃	CO1
b)	Find Fourier expansion of $f(x) = \sqrt{1 - \cos x}$ in $(0, 2\pi)$ and Hence deduce that $\frac{1}{2} = \sum_{n=1}^{\infty} \frac{1}{4n^2 - 1}$	08	L ₁	CO2
OR				
b)	Find Fourier series for $f(x) = \begin{cases} a(x-l), & -l < x < 0 \\ a(x+l), & 0 < x < l \end{cases}$. Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$	08	L ₁	CO2
Q.2 Solve the following				
a)	Find the Fourier transform of $f(x) = \begin{cases} 1, & x < a \\ 0, & x > a \end{cases}$. Hence evaluate $\int_0^{\infty} \frac{\sin a\omega}{\omega} d\omega$.	07	L ₁	CO3
OR				
a)	Find the Fourier sine transform of $f(x) = e^{-x}$ and hence show that $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx = \frac{\pi}{2} e^{-m}$	07	L ₃	CO3

ESE

- b) A particle moves on the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$, where t is the time. Find the component of velocity and acceleration at time $t = 1$ in the direction $i - 3j + 2k$. 08 L₂ CO6

OR

- b) If $\phi = x^3 + y^3 + z^3 - 3xyz$, find (i) $\vec{r} \cdot \nabla \phi$ (ii) $\text{div } \vec{F}$ (iii) $\text{curl } \vec{F}$, where $\vec{F} = \nabla \phi$. 08 L₁ CO6

Q.3 Solve any Two

- a) Solve $(D^3 + 2D^2 + D)y = x^2 + x$ 08 L₃ CO1

- b) Find Fourier expansion of the function $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ 08 L₁ CO2

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots$

- c) Find the Fourier cosine transform of $\frac{1}{1+x^2}$ 08 L₁ CO3

- d) Prove that $\nabla \cdot \left(r \nabla \frac{1}{r^n} \right) = \frac{n(n-2)}{r^{n+1}}$ 08 L₂ CO6

Q.4 Solve any Three

- a) Find Laplace transform of $f(t) = te^{3t} \sin 2t$ 06 L₁ CO4

- b) Find Laplace transform of $f(t) = \int_0^t e^u \frac{\sin 4u}{u} du$ 06 L₁ CO4

- c) Find Laplace transform of $f(t) = \begin{cases} \frac{t}{a}, & 0 < t < a \\ \frac{1}{a}(2a-t), & a < t < 2a \end{cases}$ and 06 L₁ CO4

$$f(t) = f(t+2a).$$

- d) Find inverse Laplace transform of $\tan^{-1} \left(\frac{2}{s^2} \right)$ 06 L₁ CO4

Q.5 Solve any Three

- a) Find Z transform of $x_k = 3^k + 5^k$, $k < 0$ 06 L₁ CO5

- b) Find Z transform of $x_k = \frac{\sin ak}{k}$, $k \geq 0$ 06 L₁ CO5

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c) Find inverse Z transform of $F(z) = \frac{1}{(z-3)(z-2)}$ 06 L₃ CO5

if ROC is (i) $|z| < 2$ (ii) $2 < |z| < 3$

d) Obtain the Z transform of $\sinh \alpha k$, $k \geq 0$ where α being real. Hence 06 L₃ CO5
find $Z[e^{-3k} \sinh 2k]$

Q.6 Solve any Three

a) Use convolution theorem to find inverse Laplace transform of 06 L₃ CO4
 $\frac{s}{(s^2 + 4)(s^2 + 1)}$

b) Find Laplace transform of 06 L₁ CO4
(i) $f(t) = e^{-2t} + 2t^3 + \cos 4t$ (ii) $f(t) = \cos(\omega t + \beta)$

c) Find Z transform of $x_k = 2^k \cos(3k + 2)$, $k \geq 0$ 06 L₁ CO5

d) Find inverse Z transform of $F(z) = \frac{1}{(z-5)^3}$ if ROC is $|z| > 5$ 06 L₁ CO5
