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

2019-20
EXM/P/09/00

Year and Program: 2019-20 T.Y. B.Sc. | **School of Science** | **Department: Mathematics**

Course Code – MTS 305.1 | **Course Title – Laplace Transform** | **Semester – V**

Day and Date – Saturday 23/11/19 | **End Semester Examination** | **Time:** 1/2 hr 10.30am to 11am

Max Marks: 100

PRN number – | **Seat no-** | **Answer Booklet No.-**

Section-A

Students' Signature - | **Invigilator's Signature –**

Instructions:

1) All questions are compulsory.
2) **Attempt Q.1 within first 30 minutes.**
3) Each MCQ type question is followed by four plausible alternatives, Tick (√) the correct one.
4) Answer to question 1 should be written in the question paper and submit to the Jr. Supervisor.
5) If you tick more than one option it will not be evaluated.
6) Figures to the right indicate full marks.
7) Use **Blue ball pen** only.

Q.1 Tick mark (√) correct alternative — Marks | Bloom's Level | Cos

1) Laplace transform of $e^t \sin(at)$ is — 02 | L_1 | CO1

A) $\dfrac{a}{a^2+(s+1)^2}$, C) $\dfrac{s+1}{a^2+(s+1)^2}$,

B) $\dfrac{a}{a^2+(s-1)^2}$, D) $\dfrac{s-1}{a^2+(s-1)^2}$.

2) Laplace transform of $t\cos(t)$ is — 02 | L_2 | CO2

A) $\dfrac{s^2-1}{\left(s^2+1\right)^2}$, C) $\dfrac{-s^2-1}{\left(s^2+1\right)^2}$,

B) $\dfrac{-s^2+1}{\left(s^2+1\right)^2}$, D) $\dfrac{2s^2-1}{\left(s^2+1\right)}$.

ESE

3) Let $H(t-a)=\begin{cases}0 & ;t<a\\ 1 & ;t\geq a\end{cases}$. Then $L\{H(t-a)\}$ is 02 L_1 CO3

A) $\frac{1}{s}$, C) $\frac{1}{s}e^{-as}$,

B) $\frac{1}{s}e^{as}$, D) $\frac{1}{s}$.

4) The value of $L^{-1}\left\{\frac{1}{s-2}+\frac{2}{s+5}+\frac{6}{s^4}\right\}$ is 02 L_4 CO4

A) $e^{2t}+2e^{-5t}+t^3$, C) $e^{-2t}+2e^{5t}+\frac{t^3}{3}$,

B) $e^{-2t}+2e^{5t}+t^3$, D) $e^{2t}+2e^{-5t}+\frac{t^3}{3!}$.

5) The inverse Laplace transform of $\frac{1}{(s-a)^2+b^2}$ is 02 L_1 CO4

A) $\frac{1}{b}e^{at}\sin(bt)$, C) $e^{at}\sin(bt)$,

B) $\frac{1}{b}e^{-at}\sin(bt)$, D) $e^{-at}\sin(bt)$.

6) The inverse Laplace transform of $\frac{1}{s^n}$ is 02 L_3 CO4

A) $\frac{t^n}{n!}$, C) $\frac{t^n}{(n-1)!}$,

B) $\frac{t^{n-1}}{(n-1)!}$, D) $\frac{t^{n+1}}{(n+1)!}$.

7) Let $L^{-1}\{f(s)\}=F(t)$ and $F(0)=0$, then $L^{-1}\{s\cdot f(s)\}$ is 02 L2 CO5

A) $F(t)$, C) $\frac{d}{dt}F(t)$,

B) $\frac{F(t)}{t}$, D) $\int_0^t F(u)du$.

8)	Let $L^{-1}\{f(s)\}=F(t)$ then the value of $L^{-1}\left\{\int_s^\infty f(s)ds\right\}$ is	02	L_4	CO5

A) $F(t)$,

C) $\frac{F(t)}{t}$,

B) $tF(t)$,

D) $t^2F(t)$.

9)	The inverse Laplace transform of $\tan^{-1}\left(\frac{2}{s}\right)$ is	02	L_3	CO5

A) $\frac{1}{2}\sin t$,

C) $\frac{1}{t}\sin 2t$,

B) $\frac{1}{2}\sin 2t$,

D) $\frac{1}{t}\sin t$.

10)	Let $L^{-1}\{f(s)\}=F(t)$, $L^{-1}\{g(s)\}=G(t)$ then $L^{-1}\{f(s)g(s)\}$ is	05	L_4	CO5

A) $\int_0^\infty F(u)G(t-u)du$,

C) $\int_0^t F(u+t)G(t-u)du$,

B) $\int_0^\infty F(u)G(u-t)du$,

D) $\int_0^t F(u)G(t-u)du$.

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EXM/P/09/01

Year and Program: 2019-20 B.Sc.-III	**School of Science**	**Department: Mathematics**
Course Code: MTS305.1	**Course Title: Laplace Transform**	**Semester – V**
Day and Date: Saturday 23/11/19	**End Semester Examination (ESE)**	**Time:** 11am to 1.30 pm
		Max Marks: 100

Section B

Instructions:

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Non-programmable calculator is allowed.

Q.N			Marks	Bloom's Level	Cos
Q.2		Attempt any **TWO** of the following.			
	a)	If $L\{F(t)\} = f(s)$ and $G(t) = \begin{cases} F(t-a) & ;t > a \\ 0 & ;t < a \end{cases}$, then prove that $L\{G(t)\} = e^{-as} f(s)$.	06	L_2	CO1
	b)	Find $L\left\{e^{-t}\left(3\sinh 2t - 5\cosh 2t\right)\right\}$.	06	L_3	CO1
	c)	Evaluate $L\{F(t)\}$ if $F(t) = \begin{cases} (t-1)^2 & ;t > 1, \\ 0 & ;0 < t < 1. \end{cases}$	06	L_2	CO1
Q.3		Attempt any **TWO** of the following.			
	a)	Let $F(t)$ be periodic with period ω. Then prove that $$L\{F(t)\} = \frac{1}{1-e^{-sw}}\int_0^{\omega} e^{-st} F(t)dt.$$	07	L_3	CO2
	b)	Prove that $\int_0^{\infty} \frac{e^{-t}\sin t}{t} dt = \frac{\pi}{4}$.	07	L_5	CO2
	c)	Find $L\left\{t^2 e^{-t}\sin(4t)\right\}$.	07	L_3	CO2

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Q.4		Attempt any **TWO** of the following.			
	a)	Prove that $L\{J_1(t)\} = 1 - \frac{s}{\left(1+s^2\right)^{1/2}}$.	07	L_5	CO3
	b)	Find $L\left\{t \cdot erf\left(2\sqrt{t}\right)\right\} = \frac{3s+8}{s^2\left(s^2+4\right)^{3/2}}$.	07	L_3	CO3
	c)	Use Laplace transform to evaluate $\int_0^\infty \frac{e^{-t} - e^{-3t}}{t} dt$.	07	L_5	CO3
Q.5		Attempt any **TWO** of the following.			
	a)	Evaluate i) $L^{-1}\left\{\frac{e^{-3s}}{(s-4)^2}\right\}$, ii) $L^{-1}\left\{\frac{s}{2s^2-8}\right\}$.	10	L_4	CO4
	b)	Find i) $L^{-1}\left\{\frac{2s^2-4}{(s+1)(s-2)(s-3)}\right\}$, ii) $L^{-1}\left\{\frac{s+29}{(s+4)\left(s^2+9\right)}\right\}$.	10	L_2	CO4
	c)	If $f(s) = L\{F(t)\}$, then prove that i) $L^{-1}\{f(as)\} = \frac{1}{a}F\left(\frac{t}{a}\right), a > 0$, ii) $L^{-1}\{f(s-a)\} = e^{at}F(t)$.	10	L_1	CO4
Q.6		Attempt any **TWO** of the following.			
	a)	Use convolution theorem to find $L^{-1}\left\{\frac{s}{\left(s^2+9\right)\left(s^2+4\right)}\right\}$.	05	L_1	CO5
	b)	Find $L^{-1}\left\{\log\left(\frac{s^2+a^2}{s^2+b^2}\right)\right\}$.	05	L_2	CO5
	c)	Apply convolution theorem to find $L^{-1}\left\{\frac{1}{s\left(s^2+4\right)}\right\}$.	05	L_3	CO5

d)	If $f(s)=L\{F(t)\}$, then prove that $$L^{-1}\left\{\frac{f(s)}{s^2}\right\}=\int_0^t dv\int_0^v F(u)du.$$	05	L_2	CO5
e)	Find $L^{-1}\left\{\log\left(1+\frac{1}{s^2}\right)\right\}$.	05	L_2	CO5
f)	Use division by s theorem to find $L^{-1}\left\{\frac{a^2}{s(s+a)^2}\right\}$.	05	L_2	CO5

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ESE