EVENING

27 APR 2021

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~~20 MAR 2021~~

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]
Uni. Roll No. ....

[Total No. of Pages: 2]

Program: B.Tech. (Batch 2018 onward)
Semester: 4
Name of Subject: Mathematics-III
Subject Code: BSCE-101
Paper ID: 16180

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

a) State Fourier Integral Theorem.

b) Find $L^{-1}\left(\frac{1}{p(p-3)}\right)$.

c) Define partially ordered set.

d) State and prove first shifting property of finding Laplace transform.

e) Consider the group $(Z,+)$ and let $H=\{3n : n\in Z\}$. Show that H is a subgroup of Z.

f) Prove that every distributive lattice is modular.

Part – B

[Marks: 04 each]

Q2. Find the Laplace transform of $\frac{1-\cos 2t}{t}$.

Q3. Find the Fourier transform of $f(x)=\begin{cases}1-x^2 & if\ |x|\le 1\\ 0 & if\ |x|>1\end{cases}$.

Q4. Find the right cosets of the subgroup $\{1,-1\}$ of the group $\{1,-1,i,-i\}$ under multiplication.

Q5. Show that the set $G=\{1,2,3,4,5,6\}$ is a group under multiplication modulo7.

P.T.O.

Q6. Using Parseval's identity, prove that $\int_0^\infty \frac{dt}{(a^2+t^2)(b^2+t^2)} = \frac{\pi}{2ab(a+b)}$.

Q7. Show that for a bounded, distributive lattice, complement of an element is unique.

Part – C **[Marks: 12 each]**

Q8. Using Laplace transform, solve the differential equation

$$\frac{d^2x}{dt^2}+2\frac{dx}{dt}+5x=e^{-t}\sin t, \text{where } x(0)=0 \text{ and } x'(0)=1.$$

OR

Use Fourier sine transform to solve the equation $\frac{\partial u}{\partial t}=2\frac{\partial^2 u}{\partial x^2}$ under the conditions $u(0,t)=0, u(x,0)=e^{-x}\,(x>0)$, $u(x,t)$ is bounded where $x>0, t>0$.

Q9. (a) State and prove Lagrange's Theorem.

(b) Prove that intersection of two normal subgroups of a group is a normal subgroup.

OR

Prove that product of two lattices is a lattice.

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