Please check that this question paper contains_____9_ questions and ___2___ printed pages within first ten minutes.

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

Program: B.Tech. (Batch 2018 onward)
Semester:4th
Name of Subject:Mathematics-111
Subject Code: BSCE- 101
Paper ID: 16180
Scientific calculator is NotAllowed

MORNING
19 SEP 2022

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) Write the negation of the disjunction:
Ram is in class XI or Arun is in clas XII.

b) State and prove linear property of Laplace Transform.

c) Write the complex form Fourier integral .

d) Define a group.

e) State Modulation theorem of Fourier Transform.

f) Define Lattice with one example.

Part – B **[Marks: 04 each]**

Q2. Evaluate the following:
(i) $L^{-1}(\frac{1}{s^2(s^2-a^2)})$ (ii) $L^{-1}(log\frac{s+1}{s-1})$

Q3. Evaluate the following:
(ii) $L(cos^3 2t)$ (ii) $L(t\sqrt{1+sin\,t})$

Q4. Find Fourier sine integral of $f(x) = e^{-\beta x}$.

Q5. Construct a truth table for the compound proposition $\sim(p \vee q) \vee (\sim p \wedge \sim q)$.

Q6. If A={1,2,3,4} and consider the relation
R = {(1,1),(1,2),(1,3),(2,2),(3,2),(3,3),(4,2),(4,3),(4,4)}
Is R a partial order relation? Justify your answer .

Q7. Prove that the fourth roots of unity $1, -1, i, -i$ form an abelian multiplicative group .

Part – C **[Marks: 12 each]**

Q8. (a) Prove that the necessary and sufficient condition for a non-empty subset H of a Group G,*) to be a subgroup is $a \in H, b \in H \Rightarrow a * b^{-1} \in H$. (6)

(b) Prove that the order of each subgroup of a finite group is a divisor of the order of the group. (6)

OR

(a) Prove that in a distributive Lattice , if an element has a compliment then this compliment is unique. (6)

(b) Prove that the product of two Lattices is a Lattice. (6)

Q9. Solve the following differential equation using Laplace transform:
$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t}sint,\ x(0) = 0,\ x'(0) = 1.$

OR

Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2},\ x > 0, t > 0$, subject to the conditions $u_x(0,t) = 0, u(x,t)$ is bounded and $u(x,0) = \begin{cases} x; & 0 \le x \le 1 \\ 0; & x > 1 \end{cases}$.

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