EVENING

[Total No. of Questions: 09]   0 4 JUL 2022   [Total No. of Pages: .02.]

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

Detail of allowed codes/charts/tables etc. ....*NA*...............................

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 and prove first shifting property of Laplace Transform.

b) Write the formula for Fourier integral of f(x).

c) Define order of an element of a group.

d) State Modulation theorem of Fourier Transform.

e) Prove that the proposition $p \vee \sim q$ is a tautology.

f) Prove that in a distributive Lattice, if an element has a complement then this complement is unique.

Part – B   [Marks: 04 each]

Q2. State and prove Convolution theorem for Inverse Laplace Transform.

Q3. Evaluate the following:

(i) $L^{-1}(\frac{s+1}{(s^2+s+1)})$ (ii) $L(\sqrt{t}e^{3t})$

Q4. Find Fourier Transform of $f(x) = \begin{cases} x : & |x| \leq a \\ 0 ; & |x| > a \end{cases}$.

Q5. Use truth table to show that $p \Rightarrow q$ is logically equivalent to $\sim p \vee q$.

Page 1 of 2

P.T.O.

Q6. A Relation R on the set Z of all integers as follows:

m R n if and only if $(m + n)$ is even for all m, n $\in$ Z. Is R a partial order relation? Justify your answer with a suitable example.

Q7. Prove that the set {0,1,2,3,4} is a finite abelian group under addition modulo 5.

Part – C   [Marks: 12 each]

Q8. (a) Prove that a subgroup H of a group G is normal if and only if $g^{-1}hg \in H$, for all

h $\in$ H, g $\in$ G.   (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) Consider the POSET A = ({1,2,3,4,6,9,12,18,36}, /). Find the greatest lower

bound and the least upper bound of the sets {6,18} and {4, 6, 9}.   (6)

(b) Define a Lattice with a suitable example and Prove that the product of two

Lattices is a Lattice.   (6)

Q9. Use Fourier cosine transform to 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 $u(x, 0) = \begin{cases} x; & 0 \leq x \leq 1 \\ 0; & x > 1 \end{cases}$.

OR

Solve the following differential equation using Laplace transform:

$$2\frac{d^2y}{dt^2} - \frac{dy}{dt} - y = cost, \ y(0) = 1, \ y'(0) = 0.$$

****