Roll No…….. **Total No. of Printed Pages: [02]**

Total No. of Questions: [09]

B. Tech. (Aerospace Engg.) (Semester – 3rd)

APPLIED MATHEMATICS-III

Subject Code: BMATH4301

Paper ID: [19113001]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) Find Laplace transform of the function $tsin3t$.

b) Find the Inverse Laplace transform of the function $\frac{s}{(s+2)^2}$.

c) Explain Shifting property of Fourier Transform.

d) If $f(x) = x^2$, $g(x) = x + 3$, Find $(i) fog,\ (ii)\ gof$.

e) Is the formula $(P \vee Q) \vee (\neg P \wedge \neg Q)$ valid? Justify your answer.

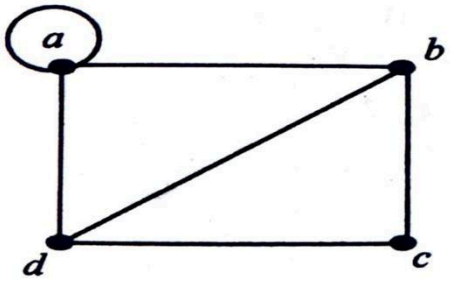
f) Define soundness and explain why it is important for a formal proof system.

g) Prove that the POSET P= {2,3,4,6} under divisibility is not a lattice.

h) State Lagrange's Theorem.

i) Evaluate C(19,17)+C(19,180).

j) Write Adjacency matrix of the following graph



Section – B **(5 marks each)**

Q2. Find the Fourier cosine Transform of e^{-x^2}.

Q3. The relation R is define by (a,b) ε R if and only if 5 divides b-a. Show that R is an equivalence relation.

Q4. Prove that the set A= {1,2,3,4,6,12} of factors of 12 under divisibility form a lattice.

Q5. There are 200 individuals with a skin disorder, 120 has been exposed to chemical C1, 50 to chemical C2 and 30 to both the chemicals C1 and C2, find the number of individuals exposed to

(i) chemical C1 or chemical C2.
(ii) chemical C1 but not chemical C2.
(iii) chemical C2 but not chemical C1.

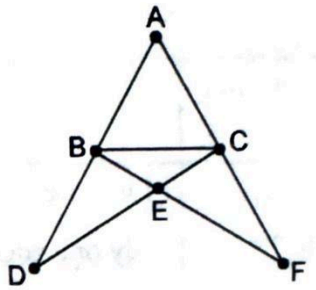
Q6. In How Many ways can the letters of the word MATHEMATICS be arranged so that all vowels occur together?

Section – C **(10 marks each)**

Q7. Solve $y'' + 4y' + 3y = e^{-t}$, $y(0) = y'(0) = 1$ using Laplace Transform.

Q8. (a) Check the validity of argument:
If man is bachelor, he is unhappy. If a man is unhappy, he dies young. Therefore, bachelors die young.
(b) State and prove De-Morgan's Law of Boolean algebra.

Q9. (a) Construct Euler's path or circuit for the following graph:



(b) Prove that **N** Set of Natural numbers form a semigroup under the operation addition. Also explain why it does not form a group.