Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec – 2019**

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| **Code :** | **18MA3002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE** | **Max. Marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Prove that a connected graph has an Euler circuit if and only if all vertices have even degree. | CO1 | 8 |
| b. | Find the Chromatic Number and Chromatic Polynomial of L4, L5, K4, K6. | CO2 | 8 |
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| 2. | a. | Prove that a tree with n vertices has n-1 edges. | CO1 | 8 |
| b. | Draw the expression tree for the following expression and traverse the tree and find all the three notations.  (y – (x+(y+x))) × ((5÷ (4 x 3)) × 7) | CO2 | 8 |
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| 3. | a. | If a, b and c be integers, where a ≠0 then prove that   1. If a / b and a / c then a / (b+c) 2. If a / b then a / bc for all integers c 3. If a / b and b / c then a / c | CO6 | 10 |
| b. | Find the GCD and LCM of 240 and 720 using prime fractorization. | CO6 | 6 |
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| 4. | a. | Let N = {S, A, B} T={a,b} Find the language generated by the grammar G=(N,T,P,S) when the set P of productions consists of   1. S→ AB, A→ ab, B →bb 2. S → AB, S →aA, A →a, B →ba 3. S → AB, S → AA, A →aB, A → ab, B →b | CO4 | 8 |
| b. | Find the output string generated by the finite state machine given in the following table, if the input string is 101011. Also draw the state diagram.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | State | f | | g | | | Input | | Input | | | 0 | 1 | 0 | 1 | | S0 | S1 | S3 | 1 | 0 | | S1 | S1 | S2 | 1 | 1 | | S2 | S3 | S4 | 0 | 0 | | S3 | S1 | S0 | 0 | 0 | | S4 | S3 | S4 | 0 | 0 | | CO4 | 8 |
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| 5. | a. | The process {X(t)} whose probability distribution under certain conditions is given by    Show that it is not stationary. | CO5 | 10 |
| b. | Find the mean and variance of the autocorrelation function  R(τ) = for the stationary random process {X(t)} | CO5 | 6 |
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| 6. | a. | Evaluate the following prefix and postfix notations:   1. + \* + - 5 3 2 1 4 2. + - \* 2 3 5 / ↑ 2 3 4 3. 3 2 \* 2 ↑ 5 3 - 8 4 / \* - 4. 7 2 3 \* - 4 ↑ 9 3 / + | CO2 | 8 |
| b. | Construct labeled tree and doubly linked list and implement the array representation for the following expression.  (7+(6 – 2)) - (x – (y – 4)) | CO2 | 8 |
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| 7. |  | Two random Processes {X(t)} and {Y(t)} are defined by X(t) = A cos λt + B sin λt and Y(t) = B cos λt – A sin λt. Show that {X(t)} and {Y(t)} are jointly wide sense stationary if A and B are uncorrelated RVs with zero means and the same variances and λ is a constant. | CO5 | 16 |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Car arrives at a petrol pump having one petrol unit in Poisson fashion with an average of 10 cars per hour. The service time is distributed exponentially with a mean of 3 minutes. Find;  (i) average numbers of cars in the system  (ii) average waiting time in the queue  (iii) average queue length  (iv) the probability that the number of cars in the system is 2. | CO3 | 10 |
| b. | A petrol pump station has 4 pumps. The service times follow an exponential distribution with a mean of 6 min and cars arrive for serive in a Poisson Process at the rate of 30 cars per hour.  (i) What is the probability that an arrival would have to wait in line?  (ii) Find the average waiting time, average time spent in the system and the average number of cars in the system.  (iii) What percentage of time would a pump be idle on an average? | CO3 | 10 |