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



**End Semester Examination – Nov/Dec – 2018**

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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. | Let the number of edges in a graph G be m. Prove that G has Hamiltonian circuit if . | CO1 | 8 |
| b. | State and Prove Euler’s formulae. | CO1 | 8 |
|  |  |  |  |  |
| 2. | a. | Prove that a tree with n vertices has n-1 edges. | CO1 | 6 |
| b. | State Krushkal’s algorithm and find the minimal spanning tree for the following graph.  A  B  C  D  E  G  12  10  15  14  12  20  12  16  15  F  10  20 | CO2 | 10 |
|  |  |  |  |  |
| 3. | a. | Prove that there are infinitely many primes. | CO6 | 6 |
| b. | Find the greatest common divisor of 414 and 662 using Euclidean Algorithm. Also express gcd(414, 662) as linear combination of 414 and 662. Identify Bezout’s coefficient. | CO6 | 10 |
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| 4. | a. | Construct the derivation tree of 03 13 using the Grammar  G= ({S,0,1}, {0,1}, S, {S 🡪 0S1, S🡪λ} | CO4 | 5 |
| b. | Find the Grammar for the language L(G) = {anbm / n,m ≥ 0}. | CO4 | 5 |
| c. | Construct the state diagram for the finite state automatorn M = (S, I, f, S0, F) where S = {S0, S1, S2, S3 }, I = {0.1}, F = { S0, S3} and the transition function is given by   |  |  |  | | --- | --- | --- | | State | f | | | Input | | | 0 | 1 | | S0 | S0 | S1 | | S1 | S0 | S2 | | S2 | S0 | S0 | | S3 | S2 | S1 | | CO4 | 6 |
|  |  |  |  |  |
| 5. | a. | Show that the process X(t) = A cosλt + B sinλt (where A and B are RVs) is wide sense stationary if (i) E(A) = E(B) = 0; (ii) E(A2) = E(B2) and (iii) E(AB) = 0. | CO5 | 9 |
|  | b. | Find the mean and variance of the stationary process {X(t)}, whose ACF is given by . | CO5 | 7 |
|  |  |  |  |  |
| 6. | a. | State Fleury's algorithm and use it to produce an Euler circuit for the following graph.  D  A  B  C  E  F  G  H | CO2 | 8 |
| b. | Find the Chromatic Number and Chromatic Polynomial for the following graph: | CO2 | 8 |
|  |  |  |  |  |
| 7. |  | State and prove Kleene’s theorem. | CO4 | 16 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Arrivals at a telephone booth are considered to be Poisson with an average time of 12 min between one arrival and the next. The length of a phone call is assumed to be distributed exponentially with mean 4 min   1. Find the average number of persons waiting in the system 2. What is the probability that it will take him more than 10 min, altogether to wait for the phone and complete his call? 3. Estimate the fraction of the day when the phone will be in use. | CO3 | 10 |
| b. | A super market has two sales girls attending to sales at the counters. If the service time for each customer is exponential with mean 4 min and if people arrive in Poisson fashion at the rate of 10 per hour   1. What is the probability that a customer has to wait for service? 2. Estimate the expected percentage of idle time for each girl. 3. If the customer has to wait in the queue, what is the expected length of his waiting time? | CO3 | 10 |