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**C Reg. No. :**

**Question Paper Code: 51P02**

M.E. DEGREE EXAMINATION, NOV 2017

First Semester

Communication Systems

15PMA122 - APPLIED MATHEMATICS FOR COMMUNICATION ENGINEERS

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1. | For the Bessel function  is equals to | | | | | CO1- R |
|  | (a) | (b) | | (c) | | (d) |
| 2. | If A unitary then | | | | | CO2- R |
|  | (a) | (b) | | (c) | | (d) |
| 3. | Find the value of | | | | | CO3- R |
|  | (a) | (b) | | (c) | | (d) |
| 4. | Total number of allotment in transportation problem for m rows and n columns | | | | | CO4- R |
|  | (a) m+n | (b) m+n-1 | | (c) m+n-2 | | (d) m-n |
| 5. | In Kendall’s notation (a/b/c): (d/e) , “b” refers to | | | | | CO5- R |
|  | (a)Service time distribution | | (b) Waiting time distribution | |  |  |
|  | (c) Queue length | | (d) None | |  |  |

|  |  |  |  |  |
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|  | PART – B (5 x 3= 15Marks) | | | |
| 6. | State the orthogonal property of Bessel’s functions. CO1- U | | | |
| 7. | Define Unitary matrix. CO2- U | | | |
| 8. | Find the Laplace transform of . CO3 -U | | | |
| 9. | Difference between the transportation problem and the assignment problem. CO4- U | | | |
| 10. | Explain find the source model. CO5- U | | | |
|  | PART – C (5 x 16= 80Marks) | | | |
|  |  |  |  |  |
| 11. | (a) | State and prove the orthogonal property of Bessel’s functions | CO1-App | (16) |
|  |  | Or |  |  |
|  | (b) | State and prove the orthogonal property of Legendre’s Polynomial. | CO1-App | (16) |
|  |  |  |  |  |
| 12. | (a) | Find the Q.R decomposition of the matrix | CO2- App | (16) |
|  |  | Or |  |  |
|  | (b) | Solve the Equation using least square method  X3 + 2x4 = 1, X1 + 2X2 +2X3 +3X4 =2. | CO2- App | (16) |
|  |  |  |  |  |
| 13. | (a) | A String is stretched and fixed between 2 points (0,0) and (L,0) Motion is initiated by displacing the string in the form  u = x sin and me leased from rest at time t = 0 find the displacement of the string at any time t. | CO3- Ana | (16) |
|  |  | Or |  |  |
|  | (b) | An infinitely long string having one end at x=o is initially at rest on the x axis. The end x=o undergoes a periodic transverse displacement described by , t > o, Find the displacement at 08 any point on the string at any time t. | CO3- Ana | (16) |
|  |  |  |  |  |
| 14. | (a) | Solve the following LP Problem using simplex method.  Maximize Z = 3x1 – x2  Subject to the constraints  (i) 2x1 + x2≤ 2  (ii) x1 + 3x2≥ 3  (iii) x2≤ 4 and x1, x2, ≥ 0. | CO4- App | (16) |
|  |  | Or |  |  |
|  | (b) | Solve the following LP problem by using the two-phase simplex method.  Minimize Z = x1 + x2  Subject to the constraints   1. 2x1 + x2≥ 4, 2. x1 + 7x2≥ 7 and x1, x2≥ 0 | CO4- App | (16) |
|  |  |  |  |  |
| 15. | (a) | Customer arrive at the first class ticket counter of a Theatre at the rate of 12 per hour. There is one clerk serving the customers at the rate of 30 per hour.    (a) What is the probability that there is no customer in the counter  (i.e., the system is idle)?  (b) What is the probability that there are more than 2 customers in  the counter?  (c) What is the probability that there is no customer waiting to be  server?  (d) What is the probability that a customer is being served and no  body is waiting?. | CO5- U | (16) |
|  |  | Or |  |  |
|  | (b) | A general insurance company has three claim adjusters in its branch office. People with claims against the company are found to arrive in Poisson fashion at an average rate of 20 per 8 hour day. The amount of time that an adjuster spends with a claimant is found to have negative exponential distribution with mean service time 40 minutes. Claimants are processed in the order of their appearance.   1. How many hours a week can a adjuster expect to spend with claimants? 2. How much time, on the average, does claimant spend in the branch office? | CO5- U | (16) |