Reg. No. : | | | | | | | | | | |

Question Paper Code: 52101

M.E. DEGREE EXAMINATION, DECEMBER 2015

First Semester

Computer Science and Engineering

15PMA121 - ADVANCED MATHEMATICS FOR COMPUTING

[Common to Computer Science and Engineering (With Specialization in Networks)]

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The error committed in accepting H_0, when it is false is called

   (a) Type I error (b) Zero error (c) H_0 error (d) Type II error

2. The estimators obtained by the method of moments are identical with those given by the method of maximum likelihood if the pdf is of the form

   (a) $f(x, \theta) = \log L$ (b) $f(x, \theta) = \exp\left(b_0 + b_1 x + b_2 x^2 + ...\right)$

   (c) $f(x, \theta) = \exp\left(b_0 + b_1 x\right)$ (d) $f(x, \theta) = \exp\left(-b_0 + b_1 x\right)$

3. The occurrence of degeneracy while solving a transportation problem means that

   (a) total supply equals total demand (b) the solution so obtained is not feasible

   (c) the few allocation becomes negative (d) none of the above

4. The important step required for simulation approach in solving a problem is to

   (a) test and validate the model (b) design the experiment

   (c) conduct the experiment (d) all of the above

5. A graph having a vertex of degree ------ is not a Hamiltonian graph.

(a) One (b) Two (c) Three (d) More than 4

PART - B (5 x 3 = 15 Marks)

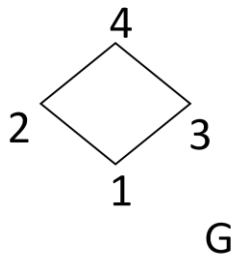
6. What is ψ^2 test of goodness of fit?

7. If T is an unbiased estimator for θ, show that T^2 is a biased estimator for θ^2.

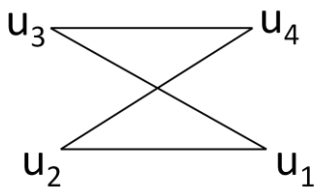
8. What do you understand by the term two-phase method of solving linear programming problem?

9. List the advantages and disadvantages of Monte-Carlo methods.

10. Check whether the graphs G and G' are isomorphic (or) not.



G



G'

PART - C (5 x 16 = 80 Marks)

11. (a) (i) In a large city *A*, 20 percent of a random sample of 900 school boys had a slight physical defect. In another large city *B*, 18.5 percent of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant? (8)

(ii) A group of 10 rats fed on diet *A* and another group of 8 rats fed on a different diet *B*, recorded the following increase in weight.

Diet *A*: 5, 6, 8, 1, 12, 4, 3, 9, 6, 10 *gms*

Diet *B*: 2, 3, 6, 8, 1, 10, 2, 8 *gms*. (8)

Or

(b) (i) The following table shows the distribution of digits in the numbers chosen at random from telephone directory:

Digit	0	1	2	3	4	5	6	7	8	9	Total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10,000

Test whether the digits may be taken to occur equally frequently in the directory. (8)

(ii) In an investigation of the attitude of the purchasing nature, 400 shoppers are chosen at random in a locality A of a city. Their average weekly food expenditure was Rs.250 with a S.D of Rs.40. For another set of 400 shoppers chosen at random in another locality of the same city, the average weekly food expenditure was Rs.220 with a S.D of Rs.55. Test at 1% level of significance, whether the average weekly food expenditure of the two population of the shoppers are equal. (8)

12. (a) (i) Find the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample of size n. Also find its variance. (8)

(ii) Fit a parabola by the method of least squares, to the following data; also estimate y at $x = 6$ (8)

x	1	2	3	4	5
y	5	12	26	60	97

Or

(b) (i) Let $X_1, X_2, X_3, \ldots\ldots\ldots, X_n$ be a random sample from the p.d.f

$$f(x, \theta) = \begin{cases} \theta e^{-\theta x}, & 0 < x < \infty \quad \theta > 0 \\ 0, & elsewhere \end{cases}$$

Estimate θ using the method of moments. (8)

(ii) Obtain the equations of lines of regression from the following data: (8)

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

13. (a) (i) Use simplex method to solve the following problem:

Maximize $z = 6x_1 + 8x_2$

Subject to $5x_1 + 10x_2 \leq 60$

$4x_1 + 4x_2 \leq 40;$

$x_1, x_2 \geq 0.$ (8)

(ii) A department has five employees with five jobs to be performed. The time (in hours) that each man takes to perform each job is given in the effectiveness matrix.

Employees

Jobs	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man – hours? (8)

Or

(b) Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees. (16)

	W_1	W_2	W_3	W_4	W_5	Available
F_1	7	6	4	5	9	40
F_2	8	5	6	7	8	30
F_3	6	8	9	6	5	20
F_4	5	7	7	8	6	10
Required	30	30	15	20	5	100 (Total)

14. (a) (i) A bakery keeps stock of a popular brand of a cake. Based on the previous experience the daily demand pattern for the item and the associated probabilities given below:

Daily demand (number)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days. Random Numbers: 25, 39, 65, 76, 12, 05, 73, 89, 19, 49. Also estimate the daily average demand for the cakes on the basis of the simulated data. (8)

(ii) Arrivals at a service station have been found to follow a Poisson process. Mean arrival rate is $\lambda = 6$ units/hour. Simulate five hours of arrivals at the service station. (8)

Or

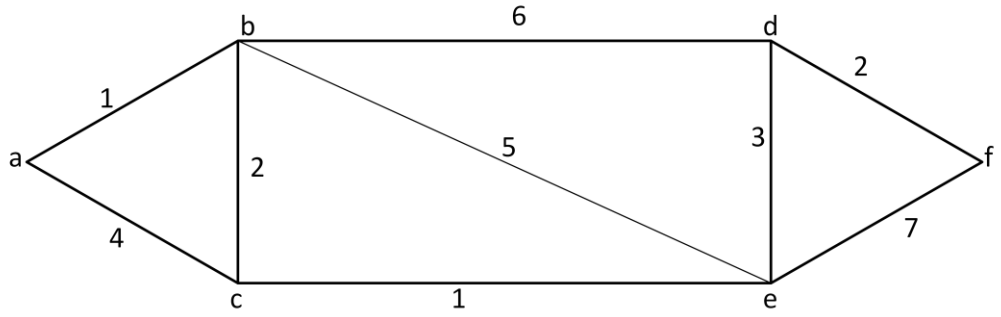
(b) A dentist schedules all his patients for 30-minute appointments. Some of the patients take more 30 minutes or less, depending on the type of dental work to be done. The following summary shows the various categories of work:

Category of service	Time required (minutes)	Probability of Category
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Checkup	15	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time of the patients as well as idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival times starting at 8.00 am. Use the following random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17, 79. (16)

15. (a) (i) Prove that a connected graph *G* is an Euler graph if and only if all vertices of *G* are of even degree. (8)

(ii) Apply Dijkstra's algorithm to the given graph below and find the shortest path from *a* to *f*. (8)



Or

(b) Consider the pipe network shown in the figure showing the flow capacities between various pairs of locations in both ways. Find the maximal flow from node1 to node 6. (16)