CSMAT401

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M S RAMAIAH INSTITUTE OF TECHNOLOGY

(AUTONOMOUS INSTITUTE, AFFILIATED TO VTU)
BANGALORE – 560 054

SEMESTER END EXAMINATIONS – JUNE 2015

Course & Branch	:	**B.E : Computer Science & Engg**	**Semester**	:	**IV**
Subject	:	**Engineering Mathematics- IV**	**Max. Marks**	:	**100**
Subject Code	:	**CSMAT401**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer one full question from each unit.

UNIT – I

1. a. i). Define intermediate value property (02)

   ii).The regression equations of two variables x and y and 2+3y+1=, x+6y-4=0. Find the mean of the variables and the coefficient of correlation between them. (03)

   b. Find a parabola of the form $y=a+bx+cx^2$ which fits most closely with the observations: (08)

x	-2	-1	0	1	2
y	-3.15	-1.39	0.62	2.88	5.378

   c. Explain Newton – Raphson iterative method to find a real root of the equation f(x) = 0 and use the method to find a root of the equation 3x – cosx -1 = 0 near x=0.6 correct to 4 decimal places. (07)

2. a. i). Define correlation and regression. (02)

   ii). Derive the normal equations to fit a straight line of the form y=ax+b by method of least squares (03)

   b. The table gives the experimental values of pressure *P* of a given mass of gas corresponding to various values of volume *V*. According to thermodynamic principles, a relationship of the form $PV^{\gamma} = C$ should exist between the variables. Find the values of γ *and* C and estimate *P* when *V* = 100 (08)

P(kg.sq.cm)	0.5	1.0	1.5	2.0	2.5	3.0
V(c.c)	1620	1000	750	620	520	460

   c. Explain Regula-Falsi iterative method to find a root of the equation f(x)=0 and use the method to find a root of the equation x^3 – 2x -5 = 0 which lies between 2 and 3. Carry out four iterations. (07)

UNIT – II

3. a. i). Define Mutually exclusive events with an example (02)

   ii).A random variable X has the density function $f(x) = \frac{k}{1+x^2}$, $-\infty < x < \infty$, determine k and evaluate P(X ≥ 0). (03)

b A bag contains 3 coins of which one is two headed and the other two are normal and fair. A coin is selected at random and tossed four times in succession. If all the four times it appears head what is the probability that the two headed coin was selected. (08)

c The probability density function of a variate X is (07)

X	1	2	3	4	5	6	7
P(X)	k	2k	2k	3k	K^2	$2k^2$	$7k^2+k$

Find (i) k (ii) Mean and variance (iii) $p(x<6)$,$p(x\geq 6)$,$p(3<x\leq 6)$

4. a. i). Define Conditional probability (02)

ii).Given a binary communication channel, where A is the input and B is the output, let P(A) = 0.4, P(B/A) = 0.9 and $P(\overline{B}/\overline{A}) = 0.6$. Find P(A/B) and $P(A/\overline{B})$. (03)

b. The pdf of a random variable X is given by $P(X = x) = \begin{cases} x & ,0 \leq x \leq 1 \\ 2 - x, & 1 < x \leq 2 \\ 0 & ,elsewhere \end{cases}$ (08)

Find (i) Cumulative distribution function F(X) and (ii) $P(X \geq 1.5)$.

c. State and prove addition theorem of probability for any two events A and B and extend the same for three events A B and C. (07)

UNIT – III

5. a. i).Write pdf of binomial distribution. (02)

ii).For the normal distribution with mean 30 and standard deviation 5, evaluate the following probabilities: i). $P(26 \leq x \leq 40)$ and $P(x \geq 45)$. (03)

b. A bag contains 3 white, 2 red, 2 green bulbs. Three bulbs are selected at random. If x & y are discrete random variables denoting number of white and red bulbs respectively, determine (i) joint distribution of X and Y (ii) Marginal distribution of X &Y (iii) Cov(X, Y). (08)

c. The sales per day in a shop is exponentially distributed with average sale amounting to Rs.100 and net profit is 8%. Find the probability that the net profit exceeds Rs.30 on two consecutive days. (07)

6. a. i).Write pdf of Gamma distribution (02)

ii). If the probability that a target is destroyed on any one shot is 1/3, what is the probability that it would be destroyed in the third shot and not before? (03)

b. In an engineering examination, a student is considered to have failed, secured second class, first class and distinction, according as he scored less than 45%, between 45% and 60%, between 60% and 75%, and above 75% respectively. In a particular year 10% of the students failed in the examination and 5% of the students got distinction. Find the percentages of students who have got first class and second class. (Assume normal distribution) (08)

c. A joint probability distribution function is given by the following table: Find Cov(X,Y) and $p(X,Y)$, P(X/4), P(Y/3) (07)

Y / X	-3	2	4
1	0.1	0.2	0.2
3	0.3	0.1	0.1

UNIT – IV

7. a. i). Write the difference between population and sample. (02)

ii). A machinist is making engine parts with axle diameter of 1.75 cm. A random sample of 10 parts shows mean diameter 1.85 cm inch with a SD of 1 cm .On the basis of the sample, would you say that the work is inferior? (03)

b. Verify whether Poisson distribution can be assumed from the data given below: (08)

x	0	1	2	3	4	5
f	142	156	69	27	5	1

c. Two independent samples of sizes 8 and 7 have the following values : (07)

Sample A	9	11	13	11	15	9	12	14
Sample B	10	12	10	14	9	8	10	-

Do the two estimates of population variance differ significantly at 5% level

8 a. i). Define null hypothesis and alternate hypothesis (02)

ii). Write short note on Type I and Type II errors (03)

b. Two horses A and B were tested according to the time (in seconds) to run a particular race with the following results (08)

Horse A	28	30	32	33	29	34	33
Horse B	29	30	30	24	27	29	-

Test whether you can discriminate between the two horses

c. The following data is collected on two characters. Based on this, can you say there is no relation between smoking and literacy? (07)

	Smokers	Non-Smokers
Literates	83	57
Illiterates	45	68

UNIT – V

9. a. i). Define stochastic matrix with an example (02)

ii). A TV repairman finds that the average time spent on a job is 30 minutes. If he repairs sets in the order in which they come in and if the average arrival of sets is 10 per 8 hour-day, what is the repairman's expected idle time each day? (03)

b. A gamblers's luck follows a pattern. If he wins a game, the probability of winning the next game is 0.6. However if he loses a game, the probability of losing the next game is 0.7. There is an even chance of gambler winning the first game. If so i) What is the probability of he winning the second game? ii). In the long run, how often he will win? (08)

c. In a workspot a crane is utilized to 75% of its capacity with 10.5 minutes as the average service time (at a time) with a standard deviation of 8.8 minutes. What is the average calling rate for service of the crane and what is the average delay in getting service? If the average service time is cut to 8 minutes with standard deviation of 6.0 minutes, how much reduction will occur an average in the delay of getting served? (07)

10 a i). Define M|M|1 Queuing model. (02)

ii).Find the fixed probability vector of the matrix $\begin{bmatrix} 3/4 & 1/4 \\ 1/2 & 1/2 \end{bmatrix}$ (03)

b. Customers arrive in a telephone booth at intervals of 12 minutes on the average. The length of a phone call is 4 minutes on the average. (08)

i).Find the average number of customers waiting in the system

ii) What is the probability that a person arriving at the booth will have to wait?

iii) What is the average length of the queue that forms from time to time?

iv) The owner of the booth will install a second booth when convinced that an arrival would expect to wait at least three minutes for the phone. By how much must the flow of arrivals be increased in order to justify a second booth?

c. Show that $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is regular and find the unique fixed probability vector. (07)

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