HALDIA INSTITUTE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION UNDER MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL)

Paper Code: MCS-PC 101

Paper Name: Mathematical Foundations of Computer Science

Time Allotted: 3 Hours *Full Marks*: 70

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Group – A

(Multiple Choice Type Questions)

Choose the correct alternatives from the followings: **10 x 1 = 10**

1.(i) The probability density function of a random variable $X$is $f(x) = kx, 0 \le x \le 2$. The value of the constant k is

a) 1 b) $\frac{1}{2}$ c) $\frac{1}{3}$ d) $\frac{2}{3}$

(ii) SRSWOR of size two is done from the population {2,3,4,6} which one of the following is a sample mean

a) 3 b) $\frac{5}{2}$ c) $\frac{3}{2}$ d) 2

(iii) Sample standard deviation is

a) a fixed quantity b) a variable quantity c) always zero d) None of these

(iv) If $(\sigma = 6)$ be the null hypothesis then which one of the following is alternative hypothesis

a) $(\sigma = 6)$ b) $(\sigma = 1)$ c) $(\sigma = 0)$ d) $(\sigma \neq 6)$

(v) A random variable X has the following probability density function $f(x) = \begin{cases} k, & -2 < x < 2 \\ 0, & otherwise. \end{cases}$

Then the value of the constant k is

a) $\frac{1}{8}$ b) $\frac{1}{2}$ c) $\frac{1}{4}$ d) $\frac{1}{12}$

(vi) The chromatic number of a graph containing a circuit of length 11 is

a) 1 b) 2 c) 3 d) none

(vii) Simple hypothesis does

a) specify the population completely b) not specify the population completely

c) simplify the calculation of parameters of the population d) None of these

(viii) The cumulative distribution function of a random variable X is given by $(x) = \begin{cases} 0, for\ x < 2 \\ x^2 - 3, for\ 2 \le x \le 5 \\ 1, for\ x > 5. \end{cases}$.

Then P (3<X<4)

a) -7 b) 7 c) -13 d) 6

(ix) If the expectation of a random variable is 2, then expectation of (2X+3) is

a) 7 b) 4 c) 3 d) 9

(x) If μ is a parameter and $H(\mu = 4)$ is null hypothesis, then which one of the following is left sided alternative hypothesis

a) $H(\mu \neq 4)$ b) $H(\mu < 4)$ c) $H(\mu > 4)$ d) $H(\mu = 4)$

Group – B
(Long Answer Type Questions)

Attempt any five from the followings: **5 x 12 = 60**

2.(i) The cumulative distribution function F(x) of a random variable X is defined as follows 6

$$F(x) = \begin{cases} 0 & -\infty < x < 0 \\ \frac{1}{5} & 0 \le x < 1 \\ \frac{3}{5} & 1 \le x < 3 \\ 1 & 3 \le x < \infty \end{cases}$$

Determine (a) the probability mass function. (b) Mean

(ii) X is a discrete random variable having the following probability mass functions:

X=x	-2	-1	0	1	2	3
P(X=x)	0.15	m	0.25	2m	0.35	m

Determine (a) the constant m (b) expectation (c) $P(X \le 0)$ 6

3.(i) The probability density function of a random variable X is $f(x) = \begin{cases} ke^{-\frac{x}{4}}, & x > 0 \\ 0 & otherwise \end{cases}$

Determine (a) The constant k (b) Mean (c) Variance 6

(ii) A random variable X has the probability density function

$$f(x) = \begin{cases} x, & 0 \le x \le 1 \\ k - x & 1 \le x \le 2 \\ 0 & otherwise \end{cases}$$

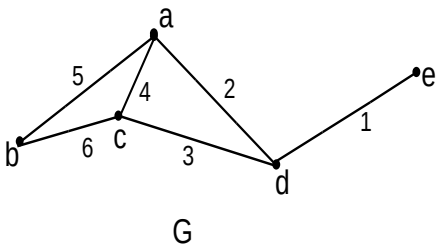
Determine (a) constant k. (b) the probability the at random variable lies between $\frac{1}{4}$and $\frac{1}{2}$. 6

4. Find the maximum likelihood estimate of the parameter of a Poisson distribution. 12

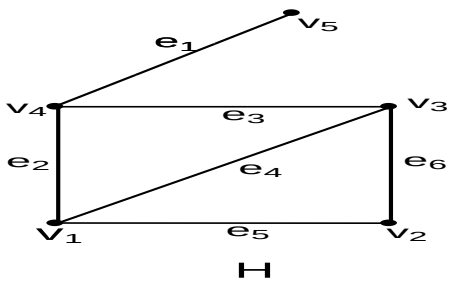
5.(i) A salesman is expected to effect an average sales of Rs. 3500 per day. Observing the sales of a particular salesman for 6 days we see that he gives average sale of Rs 3300 per day with standard deviation 1016.53.Using 0.05 level of significance conclude whether his work is below standard. [Given $t_{0.05} = 2.02\ for\ 5\ d.o.f$] 6

(ii) A tyre manufacturing company claims that the average life of their product is 69 thousand miles. A car manufacturing company planning to purchase tyre collect a sample of 10 tyre's life from the population of 1life' of tyres which are 65, 71, 64, 71, 70, 69, 64, 63, 67, 68 thousand of miles. It is known that the population is normal and the standard deviation of the population is $\sqrt{7.056}$. Test at 5% level of significance that the average life of tyre of the company is lower than they claim. (Given $P(Z > 1.65) = 0.05$). 6

6. What is isomorphism of two graphs? Prove the following graphs G and H are Isomorphism 12



G



H

7. (i) What is data mining explain with examples. 6

(ii) Write a note on Network protocols. 6

8.(i) Write a note on Computer vision applications. 6

(ii) What is Soft computing explain with examples? 6