

COMMON SECOND MID-TERM TEST - 2019

Standard XII

Reg.No.:

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Time: 1.30 hours.

BUSINESS MATHEMATICS & STATISTICS

Marks: 45

Part - A

I. Choose the correct answer:

10 x 1 = 10

1. Given $E(X) = 5$ and $E(Y) = -2$, then $E(X-Y)$ is
a) 3 b) 5 c) 7 d) -2
2. If X is the discrete random variable assuming n distinct values x_1, x_2, \dots, x_n with probabilities

P_1, P_2, \dots, P_n such that $P_i \geq 0 \forall i$ then $\sum_{i=1}^n P_i$ is equal to

- a) 0 b) 1 c) -1 d) not defined
3. The cumulative distribution function $F(x)$ is equal to
a) $P(X = x)$ b) $P(X \leq x)$ c) $P(X \geq x)$ d) all of these
4. From the given probability distribution table, find the value of k .

X	0	1	2	3
$P(X = x)$	0.3	0.2	k	0.1

- a) 0.4 b) 0.2 c) 0.3 d) 0.1
5. The probability density function $f(x)$ cannot exceed
a) zero b) one c) mean d) infinity
6. If $X \sim N(9, 81)$, then the standard normal variate Z is
a) $Z = \frac{X-81}{9}$ b) $Z = \frac{X-9}{81}$ c) $Z = \frac{X-9}{9}$ d) $Z = \frac{9-X}{9}$
7. The parametric distribution in which the mean is equal to the variance is
a) binomial b) normal c) poisson d) all the above
8. The mean of a binomial distribution is 20 and the standard deviation is 4. then the probability of failure (q) is
a) $\frac{4}{5}$ b) $\frac{1}{5}$ c) $\frac{3}{5}$ d) $\frac{2}{5}$
9. The mean of a Poisson distribution is 25, then S.D. is
a) 5 b) 25 c) 625 d) 125
10. If Z is a standard normal variate then $P(0 < Z < \infty)$ is
a) 1 b) 0.5 c) 0.25 d) 0.75

Part - B

II. Answer any 4 questions: (Ques.No.16 is compulsory)

4 x 2 = 8

11. The discrete random variable X has the probability function

X	1	2	3	4
$P(X = x)$	k	$2k$	$3k$	$4k$

Find k .

12. The following information is the probability distribution of successes.

No. of success	0	1	2
Probability	$\frac{6}{11}$	$\frac{9}{22}$	$\frac{1}{22}$

Determine the expected number of successes.

13. The probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} 4x^3, & \text{if } 0 < x < 1 \\ 0 & \text{otherwise} \end{cases} \quad \text{Find } E(X)$$

14. A fair coin is tossed 6 times. Find the probability that exactly 2 heads occurs.
15. Write any two properties of normal probability distribution and the normal curve.
16. Construct the cumulative distribution function for the given probability distribution.

X	0	1	2	3
$P(X = x)$	0.2	0.1	0.4	0.3

(2)

Part - C

4 x 3 = 12

II. Answer any 4 questions: (Ques.No.22 is compulsory)

17. The probability distribution of a discrete random variable X is given below.

$X = x$	0	1	2
$P(X = x)$	$\frac{2}{11}$	$\frac{5}{11}$	$\frac{4}{11}$

Find the mean and variance of the Random variable X .

18. Let X be a continuous random variable with probability density function.

$$f(x) = \begin{cases} 2x & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases} \quad \text{Find the mean and variance of the random variable } X.$$

19. A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of 2 successes.
20. The average number of customers, who appear in a counter of a certain bank per minute is two. Find the probability that during a given minute no customer appears. [$e^{-2} = 0.1353$]
21. The marks obtained in a certain examination follow normal distribution with mean 45 and S.D 10. If 1,300 students appeared examining. Calculate the number of students scoring less than 35 marks. [$P(0 < z < 1) = 0.3413$]
22. If X is normally distributed with mean 12 and S.D 4. Find $P(0 \leq X \leq 12)$
[$P(0 \leq z \leq 3) = 0.4987$]

Part - D

3 x 5 = 15

IV. Answer all the questions:

23. a) A random variable X has the following probability function.

X	0	1	2	3	4	5	6	7
$P(X = x)$	0	a	$2a$	$2a$	$3a$	a^2	$2a^2$	$7a^2 + a$

- i) find 'a'. Evaluate i) $P(X < 3)$, iii) $P(X > 2)$, iv) $P(2 < x \leq 5)$ (or)
- b) The length of time (in minutes) that a certain person speaks on the telephone is found to be random phenomenon, with a probability function specified by the probability density function $f(x)$ as
$$f(x) = \begin{cases} Ae^{-x/5} & \text{for } x \geq 0 \\ 0 & \text{otherwise} \end{cases} \quad \text{i) Find } A$$

ii) What is the probability that the number of minutes that a person will talk over the phone is 1) more than 10 minutes 2) between 5 and 10 minutes.
24. a) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001, determines the probability that out of 2000 individuals
i) exactly 3 and ii) more than 2 individuals will suffer a bad reaction. [$e^{-2} = 0.13533$]
(or)
b) If 18% of the bolts produced by a machine are defective, determine the probability that out of the 4 bolts chosen at random
i) exactly one will be defective ii) none will be defective
iii) almost 2 will be defective
25. a) A bank manager has observed that the length of time the customers have to wait for being attended by the teller is normally distributed with mean time of 5 minutes and standard deviation of 0.6 minutes. Find the probability that a customer has to wait i) for less than 6 minutes ii) between 3.5 and 6.5 minutes

Z	1.43	2.1429
Area	0.4236	0.4838

(or)

- b) Construct the distribution function for the discrete random variable X whose probability distribution is given below. Also draw the graph of $P(x)$ and $f(x)$.

$X = 1$	1	2	3	4	5	6	7
$Pr(X = x)$	0.10	0.12	0.20	0.30	0.15	0.08	0.05