28. An organism of n cells contains variable number of live cells. Suppose X denotes this number of live cells out of n cells, then its p.m.f. is given by

$$P(x) = \theta^x (1-\theta), \quad x = 0, 1, 2, \ldots, n-1$$
$$= \theta^n \quad x = n$$

where $0 < \theta < 1$. On this basis, find the probability that an organism contains both dead and live cells.

EXERCISE 5 (D)

Object Types Questions

- **Choose the correct alternative in question numbers 29 to 38.**

29. Which of the following can be regarded as p.m.f. for given values of X ?

(a)

X	1	2	3	4
P (x)	0.2	0.4	0.3	0.5

(b)

X	–1	0	1
P (x)	1/2	0	1/2

(c)

X	0	1	2	3
P (x)	0.3	– 0.1	0.6	0.2

(d) $P(x) = \frac{(x-1)}{2}$; $x = 0, 1, 2$

$= 0$; elsewhere.

30. The p.m.f. of a discrete random variable X is given by,

X	1	2	3	4	5
P (x)	0.1	0.25	0.25	0.2	0.2

What is $P(2 < X < 5)$?

(a) 0.9 (b) 0.5

(c) 0.45 (d) 0.3

31. If X and Y denote the points obtained when two six face unbiased dice are thrown, then $P(X = Y)$ is

(a) 1/2 (b) 1/6

(c) 1/24 (d) 1/36

32. Let X take values –1, 0, 1 and 2 with probabilities 0.2, 0.4, 0.1 and 0.3 respectively. Then X^2 takes values 0, 1 and 4 with respective probabilities.

(a) 0.4, 0.3, 0.3 (b) 0.4, 0.2, 0.5

(c) 0.16, 0.02, 0.82 (d) 0.2, 0.4, 0.1, 0.3

33. Suppose we toss a biased coin twice. Probability of getting 'head' is twice that of getting 'tail' for this coin. What will be the probability of getting no head ?

(a) 0 (b) 1/3

(c) 1/9 (d0 4/9

34. Suppose the values of distribution function F (x) at $X = x_i$ are as a given below :

X	0	1	2	3	4	5	6
$F(x_i)$	0.2	0.3	0.5	0.65	0.75	0.9	1

What is P (X = 2) ?

(a) 0.5 (b) 0.2

(c) 0 (d) can not determine.

35. Give the following probability distribution of a discrete random variable X,

x_i	– 3	– 2	– 1	0	1
$P(x_i)$	0.1	0.2	0.25	0.3	0.15

What is the median of X ?

(a) Median does not exist (b) 0

(c) –1 (d) 0.25

36. Given the following values of $F(x_i)$; what is the mode of X ?

x_i	0	1	2	3
$F(x_i)$	0.1	0.5	0.7	1

(a) 2 (b) 1

(c) 3 (d) 2

37. Which of the following is not a discrete random variable ?

(a) Number of students present in the class.

(b) Number of persons possessing 'O –ve' blood group in a blood donation camp.

(c) Number of daughters born to a couple until they get son.

(d) Weight of a new born baby.

38. For the following p.m.f. P (x), what is the value of median of X ?

$p(x) = kx;\ x = 1, 2, 3, 4, 5.$

(a) 3 (b) 4

(c) 5 (d) 1

State whether the following statements are true or false (T/F) in question numbers 39 to 43.

39. A discrete random variable cannot take negative values.

40. A distribution function F (x) is defined only at the values, the variable takes.

41. The median M of a discrete random variable is defined as that value of X such that

$P(X \leq M) \geq \frac{1}{2}$ and $P(X \geq M) \geq \frac{1}{2}$.

42. Mode of a random variable X is the maximum value that X takes.

43. A function $X : \Omega \rightarrow R$ is called as a random variable.

HINTS AND ANSWERS

5.

X	0	1	2	3
P (x)	1/8	3/8	3/8	1/8

6.

X	0	1	2
P (x)	25/36	10/36	1/36

7.

X	1	2	3	4	5	6
P (x)	1/36	3/36	5/36	7/36	9/36	11/36

8.

X	0	1	2
P (x)	60/95	32/95	3/95

9.

X	0	1	2	3
P (x)	27/64	27/64	9/64	1/64

10.

X	1	2	3	4
P (x)	1/4	1/4	1/4	1/4

11. (i) $\frac{1}{55}$, (ii) $\frac{3}{19}$, (iii) $\frac{1}{40}$

12. (i) No, (ii) Yes, (iii) Yes, (iv) No.

13. (i) $\frac{1}{49}$, (ii) $\frac{45}{49}$, (iii) $\frac{24}{49}$, (iv) 4.

(v)

X	0	1	2	3	4	5	6
P (x)	1/49	4/49	9/49	16/49	25/49	36/49	1

X	0	1	2	3	4
P (x)	0.1	0.15	0.3	0.25	0.2

15.

x	1	2	3	4	5
P (x)	1/6	1/6	2/6	1/6	1/6

$P(X \leq 3) = 4/6$

16.

x_i	x_1	x_2	x_3	x_4
$P(x_i)$	15/61	10/61	30/61	6/61

17. (i) $k = \frac{1}{3}$, (ii) $\frac{1}{9}$, (iii) $\frac{2}{3}$, (iv) $\frac{8}{9}$.

(v)

X	0	1	2
P (x)	1/9	3/9	1

18. (i) $\frac{5}{12}$

19. (i) 0.35, (ii) 0.8, (iii) 0.65, (iv) 0.65, (v) 0.6154

20. (i) 0.67, (ii) 0.43, (iii) 0.34, (iv) 0.15, (v) 0.42.

(vi)

x	– 3	– 2	– 1	0	1	2	3
P (x)	0.05	0.1	0.23	0.19	0.15	0.16	0.12

(vii) 0.57, (viii) 0.81, (ix) 0.57, (x) 0.81

21.

X	0	2	4	6	8
P (x)	0.2	0.3	0.2	0.1	0.2

22.

X	– 2.5	– 1.5	0.5	1.5	2.5
P (x)	1/6	1/6	2/6	1/6	1/6
F (x)	1/6	2/6	4/6	5/6	1

23. (i)

X	1	2	3	4	5	6	7	8
P (x)	0.08	0.04	0.11	0.08	0.17	0.14	0.23	0.15

(ii) 0.31, 0.54; (iii) 0.1932; (iv) 0.6753.

24. (i) No., (ii) Yes, (iii) No., (iv) No., (v) No., (vi) No., (viii) Yes.

25. (i) X = difference between the two numbers
$R_X = \{0, 1, 2, 3, 4, 5\}$

(ii) X = Number of runs $R_X = \{1, 2, 3, 4\}$

(iii) X = Number of red balls $R_X = \{0, 1, 2, 3\}$

(iv) X = Number of good mangoes $R_X = \{2, 3, 4, 5\}$

26. (i) and (iii)

X	0	1	2	3
P (x)	1/27	6/27	12/27	8/27
F (x)	1/27	7/27	19/27	1

(iii) 12/27

27. No. of function is not left continuous at both 2 and 3.

28. $\theta(1 - \theta^{n-1})$.

ANSWERS TO OBJECTIVE QUESTIONS

(29) b, (30) c, (31) b, (32) a, (33) c, (34) b, (35) – 1, (36) b, (37) d, (38) b.

(39) F, (40) F, (41) T, (42) F, (43) T.