



Reg. No. : .....

Name : .....

**II Semester B.Sc. Hon's (Mathematics) Degree (Supplementary)**  
**Examination, April 2023**  
**(2017-2020 Admission)**  
**BHM 205 : GRAPH THEORY AND DISTRIBUTION FUNCTIONS**

Time : 3 Hours

Max. Marks : 60

Answer any 4 questions out of 5 questions. Each question carries 1 mark. (4×1=4)

1. Define digraphs.
2. Define edge connectivity in a graph.
3. Write discrete binomial distribution with parameters  $n$  and  $p$ .
4. What are the properties of discrete distribution functions ?
5. A lot of 10 items contain 3 defectives from which a sample of 4 items is drawn without replacement. Let  $X$  be the random variable being the number of defective item in the sample. Find  $P(X = 0)$ .

Answer any 6 questions out of 9 questions. Each question carries 2 marks. (6×2=12)

6. Show that the maximum degree of any vertex in a simple graph with  $n$  vertices is  $n - 1$ .
7. Write any three properties of distance function in a connected graph.
8. Draw all non-isomorphic graphs with three vertices.
9. Show that there is one and only one path between every pair of vertices in a tree.
10. Show that, the size of a forest of order  $n$  having  $k$  components is  $n - k$ .
11. Comment the validity of the statement, "The mean of the binomial distribution 3 and variance of binomial distribution is 4".

P.T.O.



12. Let  $X$  follows Poisson distribution with  $P(X = 0) = P(X = 1) = k$ . Find the value of  $k$ .
13. Let  $X$  follows normal distribution with mean 42 and standard deviation 4. Find  $P(X < 50)$ .
14. Define gamma distribution. Write its mean.

Answer any 8 questions out of 12 questions. Each question carries 4 marks. (8×4=32)

15. Show that every graph is center of some graph.
16. Show that a graph  $G$  is completely bipartite if it does not contain  $P_4$  as an induced sub graph.
17. Show that the distance between vertices of a connected graph is a metric.
18. Show that every non trivial connected graph contains at least two vertices that are not cut vertices.
19. Let  $G$  be a graph of order  $n$  and size  $m$ . If  $G$  has no cycles and  $m = n - 1$ , then show that  $G$  is a tree.
20. Show that a tree with  $n$  vertices has  $n - 1$  edges.
21. A random variable  $X$  has the following distribution function.

Value of $X, x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	$k$	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Find the value of  $k$  and  $P(X < 6)$ .

22. In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 success are 0.4096 and 0.2048 respectively. Find the parameter  $p$  for the distribution.
23. A random variable  $X$  takes values 1, 2, 3, 4 such that  $2P(X = 1) = 3P(X = 2) = P(X = 3) = 5P(X = 4)$ . Find the probability distribution function.



24. Derive mean and moment generating function of normal distribution.
25. Let  $X$  has an exponential distribution with parameter  $\lambda$ . Find the variance of  $X$  if  $P(X \leq 1) = P(X > 1)$ .
26. Find the median of normal distribution.

Answer any 2 questions out of 4 questions. Each question carries 6 marks. (2×6=12)

27. Show that for every integer  $n \geq 2$ , there is exactly one connected nearly irregular graph of order  $n$ .
28. Let  $u$  and  $v$  be non adjacent vertices in a graph  $G$ . Show that the minimum number of vertices in a  $u - v$  separating set equals to the maximum number of internally disjoint  $u - v$  paths in  $G$ .
29. A and B throw with one die for a prize of Rs. 11, which is to be won by the player who first throws 6. If A has the first throw, find the probability distribution.
30. Find the moment generating function of exponential distribution; hence find its mean and variance.