Entrance Test for Ph.D. Programme-2018

Time: 120 Minutes **Max Marks: 100**

Discipline: Computer Applications **Set: A** **Test ID: 65**

Name: ....

Father Name: ....

Roll Number: ..... *Date:* ...../...../.....

Roll Number in words: ....

Signature of Candidate: **Signature of Invigilator:**

INSTRUCTIONS FOR CANDIDATES

1. Do not open seal before start of Exam.
2. Carefully fill all your details in top portion of this question paper. Don't leave any column blank.
3. Use blue/black ball point pen to fill details on question paper. Write only in capital letters.
4. Carefully fill all your details in top portion of OMR answer sheet. Also put your signatures at bottom portion of OMR.
5. **Use only black ball point pen to fill details & darken circles on OMR sheet. Using pencil is strictly prohibited.**
6. **Carefully fill your Roll No, Test ID, Category, Paper Set and other required details on the OMR sheet.**
7. Question paper consists of two sections. Section-I is of Research Methodology and Section-II is Subject specific. Each section contains 50 multiple choice questions. Total 100 questions of one mark each.
8. **Maximum marks are 100.**
9. **Time allowed is 120 minutes.**
10. **Qualifying marks shall be 50% for General Category and 45% for Reserved Categories.**
11. All questions are compulsory. No negative marking for wrong answers.
12. There are four alternative answers for each question out of which only one is correct.
13. You have to darken the circle of right answer on OMR answer sheet.
14. Questions left blank or attempted with two or more options/answers will not be evaluated.
15. Also read carefully the instructions on OMR answer sheet before attempting the questions.
16. Use of calculator is not allowed.
17. Log tables may be provided for calculation work, if required.
18. OMR sheet should not be folded or crushed. Don't put any stray marks on the sheet.
19. Circles on **OMR sheet** should be darkened completely. Incomplete/half filled circles will not be evaluated.
20. Do not use marker or white fluid on the OMR sheet.
21. **The medium of the examination is English only.**
22. No extra sheet will be provided for the rough work. Use the space inside the question paper pages for rough work.
23. Carrying mobile phones, electronic gadgets, notes or extra papers in examination hall is strictly prohibited.
24. Indulging in any form of unfair means, canvassing, impersonation or misbehaviour with examination staff will result in disqualification of your candidature.

Section-I

Research Methodology

1. Who authored the book "Methods in Social Research"?
   A) Wilkinson
   B) C R Kothari
   C) Kerlinger
   D) Goode and Halt
2. Social Science deals with
   A) Objects
   B) Human beings
   C) Living things
   D) Non-living things
3. "The Romance of Research" is authored by
   A) Redmen and Mory
   B) P. V. Young
   C) Robert C. Meir
   D) Harold Dazier
4. Which of the following is an example of primary data?
   A) Book
   B) Journal
   C) Newspaper
   D) Census Report
5. ICSSR stands for
   A) Indian Council for Survey and Research
   B) Indian Council for Strategic Research
   C) Indian Council for Social Science Research
   D) Inter National Council for Social Science Research

6. JRF stands for

   A) Junior Research Functions

   B) Junior Research Fellowship

   C) Junior Fellowship

   D) None of the above

7. In the formulation of problem, which of the following we need to give?

   A) Title

   B) Index

   C) Bibliography

   D) Concepts

8. Analogies are sources of

   A) Data

   B) Concept

   C) Research

   D) Hypothesis

9. When a hypothesis is stated negatively, it is called

   A) Relational Hypothesis

   B) Situational Hypothesis

   C) Null Hypothesis

   D) Casual Hypothesis

10. In a survey, there is an enumerator and

   A) Guide

   B) Respondent

   C) Supervisor

   D) Messenger

11. A short summary of Technical Paper is called

   A) Article

   B) Research Abstract

C) Publication

D) Guide

12. Ph.D. stands for

A) Doctor of Philosophy

B) Degree in Philosophy

C) Doctor of Psychology

D) None of the above

13. Failure to acknowledge the borrowed material; is called (Take and use of others as one's own)

A) Acknowledgement

B) Foot Notes

C) Index

D) Plagiarism

14. Data related to the Human beings are called

A) Territorial data

B) Organisational data

C) Peripheral data

D) Demographic data

15. Schedule is filled by which of the following?

A) Respondent

B) Enumerator

C) Everybody

D) None of the above

16. Questions in which only two alternatives are possible are called

A) Multiple choice questions

B) Dichotomous Questions

C) Open ended questions

D) Structured questions

17. Assigning numerals or other symbols to the categories or response is called

A) Editing

B) Coding

C) Transcription

D) Tabulation

18. Tippet table refers to

A) Table of random digits

B) Table used in sampling methods

C) Table used in statistical investigations

D) All of the above

19. Research and development become the index of development of country. Which of the following reasons are true with regards to the statement?

A) Because R&D reflect the true economic and social conditions prevailing in a country.

B) Because R&D targets the human development.

C) Because R&D can improve the standard of living of the people in a country.

D) All of the above.

20. The word "Anusandhan" implies

A) Attaining an aim

B) Goal orientation

C) Following an aim

D) Praying to achieve an aim

21. A Researcher wants to study the relationship of family size to income. He classifies his population into different income slabs and then takes a random sample from each slab in order. Which technique of sampling is he working with?

A) Cluster sampling

B) Random sampling

C) Stratified Random sampling

D) Systematic sampling

For Q. 22-23. The following table gives the sales of batteries manufactured by a company over the years.

Number of different batteries sold (in thousands)

Year	Types of Batteries					
	4AH	7AH	32AH	35AH	55AH	Total
1992	75	144	114	102	108	543
1993	90	126	102	84	126	528
1994	96	114	75	105	135	525
1995	105	90	150	90	75	510
1996	90	75	135	75	90	465
1997	105	60	165	45	120	495
1998	115	85	160	100	145	605

22. What was the approximate percentage increase in the sales of 55AH batteries in 1998 compared to that in 1992?

A) 28%

B) 31%

C) 33%

D) 34%

23. The percentage of 4AH batteries sold to the total number of batteries sold was maximum in the year?

A) 1994

B) 1995

C) 1996

D) 1997

24. Look the series: 22, 21, 23, 22, 24, 23, ...

A) 22

B) 24

C) 25

D) 26

25. Which word does not belong to others?

A) Dodge

B) Flee

C) Duck

D) Avoid

26. Which of the following is not an essential element of report writing?

A) Research Methodology

B) Reference

C) Conclusion

D) None of the above

27. Which of the following is non-probability sampling?

A) Snowball

B) Random

C) Cluster

D) Stratified

28. In group interview, there are

A) One interviewer and one interviewee

B) More than one interviewer and one interviewee

C) One interviewer and more than one interviewee

D) More than one interviewer and more than one interviewee

29. Uniting various qualitative methods with quantitative methods can be called as

A) Coalesce

B) Triangulation

C) Bipartite

D) Impassive

30. Books and records are the primary sources of data in:

A) clinical research

B) historical research

C) laboratory research

D) participatory research

31. The important pre-requisites of a researcher in sciences, social sciences and humanities are

A) laboratory skills, records, supervisor, topic

B) Supervisor, topic, critical analysis, patience

C) archives, supervisor, topic, flexibility in thinking

D) topic, supervisor, good temperament, pre-conceived notions

32. A college wants to give training in use of Statistical Package for Social Sciences (SPSS) to researchers. For this the college should organize

A) Lecture

B) Seminar

C) Workshop

D) Conference

33. Which One of the following is not a quality of researcher?

A) Keenness in enquiry

B) He must be of alert mind

C) His assertion to outstrip the evidence

D) Unison with that of which he is in search

34. Null means?

A) One

B) Two

C) Zero

D) None of the above

35. The depth of any research can be judged by:

A) title of the research

B) duration of the research

C) objectives of the research

D) total expenditure on the research

36. Fundamental research reflects the ability to:

A) Expound new principles

B) Synthesize new ideals

C) Evaluate the existing material concerning research

D) Study the existing literature regarding various topics

37. A ratio represents the relation between

A) Part and Part

B) Part and Whole

C) Whole and Whole

D) All of the above

38. Circle graphs are used to show:

A) How one part is related to other parts?

B) How various sections share in the whole?

C) How one whole is related to other whole?

D) How various parts are related to the whole?

39. Field-work based research is classified as:

A) Historical

B) Empirical

C) Biographical

D) Experimental

40. Statistical measure based upon the entire population is called parameter while measure based upon a sample is known as:

A) Inference

B) Statistics

C) Sample parameter

D) None of these

41. The importance of the correlation co-efficient lies in the fact that:

A) It is one of the most valid measure of statistics.

B) It is a non-parametric method of statistical analysis.

C) There is a linear relationship between the correlated variables.

D) It allows one to determine the degree or strength of the association between two variables.

42. Which one of the following is the most comprehensive source of population data?

A) Census

B) National Sample Surveys

C) Demographic Health Surveys

D) National Family Health Surveys

43. Which correlation co-efficient best explains the relationship between creativity and intelligence?

A) 0.3

B) 0.5

C) 0.6

D) 1.0

44. Normal Probability Curve should be

A) Zero skewed

B) Positively skewed

C) Negatively skewed

D) Leptokurtic skewed

45. A doctor studies the relative effectiveness of two drugs of dengue fever. His research would be classified as

A) Case Study

B) Ethnography

C) Descriptive Survey

D) Experimental Research

46. Newton gave three basic laws of motion. This research is categorized as

A) Sample Survey

B) Applied Research

C) Descriptive Research

D) Fundamental Research

47. When two or more successive footnotes refer to the same work which one of the following expressions is used?

A) et.al

B) op.cit

C) loc.cit

D) ibid

48. Nine year olds are taller than seven year olds. This is an example of a reference drawn from

A) Vertical study

B) Time series study

C) Experimental study

D) Cross-sectional study

49. Which one of the following belongs to the category of good 'research ethics'?

A) Publishing the same paper in two research journals without telling the editors

B) Trimming outliers from a data set without discussing your reasons in a research paper

C) Conducting a review of the literature that acknowledges the contributions of other people in the relevant field or relevant prior work

D) Including a colleague as an author on a research paper in return for a favor even though the colleague did not make a serious contribution to the paper

50. Which of the following are the basic rules of APA style of referencing format?

A) Alphabetically index reference list

B) Invert authors' names (last name first)

C) Italicize titles of longer works such as books and journals

D) All of the above

Section-II

Computer Applications

51. For which one of the following reasons does Internet Protocol (IP) use the time-to-live (TTL) field in the IP datagram header?

A) Ensure packets reach destination within that time

B) Discard packets that reach later than that time

C) Prevent packets from looping indefinitely

D) Limit the time for which a packet gets queued in intermediate routers.

52. Which one of the following uses UDP as the transport protocol?

A) HTTP

B) Telnet

C) DnS

D) SMTP

53. A computer on a 10Mbps network is regulated by a token bucket. The token bucket is filled at a rate of 2Mbps. It is initially filled to capacity with 16Megabits. What is the maximum duration for which the computer can transmit at the full 10Mbps?

A) 1.6 seconds

B) 2 seconds

C) 5 seconds

D) 8 seconds

54. If a class B network on the Internet has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?

A) 1022

B) 1023

C) 2046

D) 2047

55. In the slow start phase of the TCP congestion control algorithm, the size of the congestion window

A) does not increase

B) increases linearly

C) increasesquadratically

D) increases exponentially

56. Consider the following statements about the routing Protocols, Routing Information protocol (RIP) and open shortest path First (OSPF) in an IPv4 network.

I. RIP uses distance vector routing

II. RIP packets are sent using UDP

III. OSPF packets are sent using TCP

IV. OSPF operation is based on link-state routing

Which of the statement above are CORRECT?

A) I and IV only

B) I, II, and III only

C) I, II and IV only

D) II, III and IV only

57. If a class B network on the Internet has a subnet mask of 255.255.248.0, what is the maximum number of hosts per subnet?

A) 1022

B) 1023

C) 2046

D) 2047

58. Consider the following three statements about link state and distance vector routing protocols, for a large network with 500 network nodes and 4000 links.

[S1] The computational overhead in link state protocols is higher than in distance

vector protocols.

[S2] A distance vector protocol (with split horizon) avoids persistent routing loops, but not a link state protocol.

[S3] After a topology change, a link state protocol will converge faster than a distance vector protocol.

Which one of the following is correct about S1, S2, and S3 ?

A) S1, S2, and S3 are all true.

B) S1, S2, and S3 are all false.

C) S1 and S2 are true, but S3 is false.

D) S1 and S3 are true, but S2 is false

59. Consider the following schedules involving two transactions. Which one of the following statements is TRUE?

S_1: $r_1(X)$;r1(Y); $r_2(X)$; $r_2(Y)$; $w_2(Y)$; $w_1(X)$

S_2: r1(X) ;$r_2(X)$; $r_2(Y)$; $w_2(Y)$; $r_1(Y)$;$w_1(X)$

A) Both S_1 and S_2 are conflict serializable.

B) S_1 is conflict serializable and S2 is not conflict serializable.

C) S_1 is not conflict serializable and S_2 is conflict serializable.

D) Both S_1 and S_2 are not conflict serializable.

60. Information about a collection of students is given by the relation studinfo(studId, name, sex). The relation enroll(studId, courseId) gives which student has enrolled for (or taken) that course(s). Assume that every course is taken by at least one male and at least one female student. What does the following relational algebra expression represent?

$\prod_{courseId}((\prod_{studId}(\sigma_{sex="female"}(studInfo))\times(\prod_{courseId}(enroll))-enroll)$

A) Courses in which all the female students are enrolled.

B) Courses in which a proper subset of female students are enrolled.

C) Courses in which only male students are enrolled.

D) None of the above

61. Which one of the following is a key factor for preferring B+ -trees to binary search trees for indexing database relations?

A) Database relations have a large number of records

B) Database relations are sorted on the primary key

C) B+ -trees require less memory than binary search trees

D) Data transfer from disks is in blocks

62. The following table has two attributes A and C where A is the primary key and C is the foreign key referencing A with on-delete cascade.

A	C
2	4
3	4
4	3
5	2
7	2
9	5
6	4

The set of all tuples that must be additionally deleted to preserve referential integrity when the tuple (2,4) is deleted is:

A) (3,4) and (6,4)

B) (5,2) and (7,2)

C) (5,2), (7,2) and (9,5)

D) (3,4), (4,3) and (6,4)

63. Consider a relation scheme R = (A, B, C, D, E, H) on which the following functional dependencies hold: {A–>B, BC–>D, E–>C, D–>A}. What are the candidate keys of R?

A) AE, BE

B) AE, BE, DE

C) AEH, BEH, BCH

D) AEH, BEH, DEH

64. Data_of_Birth → Age

Age → Eligibility

Name → Roll_number

Roll_number → Name

Course_number → Course_name

Course_number → Instructor

(Roll_number, Course_number) → Grade

The relation (Roll_number, Name, Date_of_birth, Age) is:

A) In second normal form but not in third normal form

B) In third normal form but not in BCNF

C) In BCNF

D) None of the above

65. Consider the set of relations shown below and the SQL query that follows.

Students: (Roll_number, Name, Date_of_birth)

Courses: (Course number, Course_name, Instructor)

Grades: (Roll_number, Course_number, Grade)

selectdistinct Namefrom Students, Courses, Gradeswhere Students. Roll_number = Grades.Roll_numberandCourses.Instructor = KorthandCourses.Course_number = Grades.Course_numberandGrades.grade = A

Which of the following sets is computed by the above query?

A) Names of students who have got an A grade in all courses taught by Korth

B) Names of students who have got an A grade in all courses

C) Names of students who have got an A grade in at least one of the courses taught by Korth

D) None of the above

66. Given the basic ER and relational models, which of the following is INCORRECT?

A) An attribute of an entity can have more than one value

B) An attribute of an entity can be composite

C) In a row of a relational table, an attribute can have more than one value

D) In a row of a relational table, an attribute can have exactly one value or a NULL value

67. Consider the table employee(empId, name, department, salary) and the two queries Q_1 ,Q_2 below. Assuming that department 5 has more than one employee, and we want to find the employees who get higher salary than anyone in the department 5, which one of the statements is TRUE for any arbitrary employee table?

Q_1 : Select e.empId From employee e Where not exists (Select * From employee s where s.department = "5" and s.salary>=e.salary)

Q_2 : Select e.empId From employee e Where e.salary> Any (Select distinct salary From employee s Where s.department = "5")

A) Q_1 is the correct query

B) Q_2 is the correct query

C) Both Q_1 and Q_2 produce the same answer.

D) Neither Q_1 nor Q_2 is the correct query

68. A process executes the following code

for (i = 0; i < n; i + +) fork ( );

The total number of child processes created is

A) n

B) 2^n-1

C) 2^n

D) $2^{n+1}-1$

69. Which of the following is NOT an advantage of using shared, dynamically linked libraries as opposed to using statically linked libraries?

A) Smaller sizes of executable files

B) Lesser overall page fault rate in the system

C) Faster program startup

D) Existing programs need not be re-linked to take advantage of newer versions of libraries

70. A uni-processor computer system only has two processes, both of which alternate 10ms CPU bursts with 90ms I/O bursts. Both the processes were created at nearly the same time. The I/O of both processes can proceed in parallel. Which of the following scheduling strategies will result in the least CPU utilization (over a long period of time) for this system?

A) First come first served scheduling

B) Shortest remaining time first scheduling

C) Static priority scheduling with different priorities for the two processes

D) Round robin scheduling with a time quantum of 5 ms

71. The minimum number of page frames that must be allocated to a running process in a virtual memory environment is determined by

A) the instruction set architecture

B) page size

C) physical memory size

D) number of processes in memory

72. In a file allocation system, which of the following allocation scheme(s) can be used if no external fragmentation is allowed?

I. Contiguos

II. Linked

III. Indexed

A) I and III only

B) II only

C) III only

D) II and III only

73. An operating system uses the *Banker's algorithm* for deadlock avoidance when managing the allocation of three resource types X, Y, and Z to three processes P0, P1, and P2. The table given below presents the current system state. Here, the *Allocation* matrix shows the current number of resources of each type allocated to each process and the *Max* matrix shows the maximum number of resources of each type required by each process during its execution.

	Allocation			Max		
	X	Y	Z	X	Y	Z
P0	0	0	1	8	4	3
P1	3	2	0	6	2	0
P2	2	1	1	3	3	3

There are 3 units of type X, 2 units of type Y and 2 units of type Z still available. The system is currently in a safe state. Consider the following independent requests for additional resources in the current state:

REQ1: P0 requests 0 units of X, 0 units of Y and 2 units of Z

REQ2: P1 requests 2 units of X, 0 units of Y and 0 units of Z

Which one of the following is TRUE?

A) Only REQ1 can be permitted.

B) Only REQ2 can be permitted.

C) Both REQ1 and REQ2 can be permitted.

D) Neither REQ1 nor REQ2 can be permitted.

74. Consider the following C program that attempts to locate an element x in an array Y[ ] using binary search. The program is erroneous.

```
f(int Y[10] , int x ){
        int u, j, k;
        i = 0; j = 9;
        do {
                k = (i + j) /2;
                if (Y[k] < x) i = k;else j = k;
          } while ((Y[k] != x) && (i < j)) ;
        if (Y[k] == x) printf( "x is in the array ") ;
        elseprintf(" x is not in the array ") ;
         }
```

On which of the following contents of Y and x does the program fail?

A) Y is [1 2 3 4 5 6 7 8 9 10] and x < 10

B) Y is [1 3 5 7 9 11 13 15 17 19]and x < 1

C) Y is [2 2 2 2 2 2 2 2 2 2] and x > 2

D) Y is [2 4 6 8 10 12 14 16 18 20] and 2 < x < 20 and x is even

75. What is printed by the following C program?

```
int f(int x, int *py, int **ppz)
{
    int y, z;
    **ppz += 1; z = **ppz;
  *py += 2; y = *py;
  x += 3;
  return x + y + z;
}

void main()
{
 int c, *b, **a;
    c=4; b=&c; a=&b;
    printf("%d", f(c,b,a));
}
```

A) 18

B) 19

C) 21

D) 22

76. struct item

```
        {
int data;
struct item * next;
        };
int f(struct item *p)
        {
return ((p == NULL) || (p->next == NULL) ||
((P->data <= p->next->data) &&
f(p->next)));
        }
```

For a given linked list p, the function f returns 1 if and only if

A) the list is empty or has exactly one element

B) the elements in the list are sorted in non-decreasing order of data value

C) the elements in the list are sorted in non-increasing order of data value

D) not all elements in the list have the same data value.

77. Consider the C program shown below.

```
#include <stdio.h>
#define print(x) printf("%d ", x)
int x;
void Q(int z)
{
z += x;
print(z);
}
void P(int *y)
```

```
{
int x = *y + 2;
Q(x);
*y = x - 1;
print(x);
}
main(void)
{
x = 5;
P(&x);
print(x);
}
```

The output of this program is

A) 12 7 6

B) 22 12 11

C) 14 6 6

D) 7 6 6

78. $(1217)_8$ is equivalent to

A) $(1217)_{16}$

B) $(028F)_{16}$

C) $(2297)_{10}$

D) $(0B17)_{16}$

79. In the C language

A) At most one activation record exists between the current activation record and the activation record for the main

B) The number of activation records between the current activation record and the activation record for the main depends on the actual function calling sequence.

C) The visibility of global variables depends on the actual function calling sequence.

D) Recursion requires the activation record for the recursive function to be saved on a different stack before the recursive function can be called.

80. The value of j at the end of the execution of the following C program

```
int incr (int i)
{
static int count = 0;
count = count + i;
return (count);
}
main ()
{
int i,j;
for (i = 0; i <=4; i++)
j = incr(i);
}
```

A) 10

B) 4

C) 6

D) 7

81. What is the minimum number of gates required to implement the Boolean function (AB+C) if we have to use only 2-input NOR gates?

A) 2

B) 3

C) 4

D) 5

82. The number 43 in 2's complement representation is

A) 01010101

B) 11010101

C) 00101011

D) 10101011

83.

wx / yz	00	01	11	10
00	0	x	0	x
01	x	1	x	1
11	0	x	1	0
10	0	1	x	0

Given the above Karnaugh map, which one of the following represents the minimal Sum-Of-Products of the map?

A) xy + y'z

B) wx'y' + xy + xz

C) w'x + y'z + xy

D) xz+y

84. Which one of the following expressions does NOT represent exclusive NOR of x and y?

A) xy+x'y'

B) $x \oplus y'$

C) $x' \oplus y$

D) $x' \oplus y'$

85. The simplified SOP (Sum Of Product) form of the boolean expression (P + Q' + R') . (P + Q' + R) . (P + Q + R') is

A) (P'.Q + R')

B) (P + Q'.R')

C) (P'.Q + R)

D) (P.Q + R)

86. The minterm expansion of f(P, Q, R) = PQ + QR' + PR' is

A) m2 + m4 + m6 + m7

B) m0 + m1 + m3 + m5

C) m0 + m1 + m6 + m7

D) m2 + m3 + m4 + m5

87. Consider the following statements about the context free grammar

$G = \{S \rightarrow SS, S \rightarrow ab, S \rightarrow ba, S \rightarrow \epsilon\}$

I. G is ambiguous

II. G produces all strings with equal number of a's and b's

III. G can be accepted by a deterministic PDA.

Which combination below expresses all the true statements about G?

A) I only

B) I and III only

C) II and III only

D) I, II and III

88. Consider the regular language L = (111 + 11111)*. The minimum number of states in any DFA accepting this languages is:

A) 3

B) 5

C) 8

D) 9

89. Which one of the following is a top-down parser?

A) Operator precedence parser.

B) Recursive descent parser.

C) An LR(k) parser.

D) An LALR(k) parser.

90. Which of the following statements is false?

A) Every NFA can be converted to an equivalent DFA

B) Every non-deterministic Turing machine can be converted to an equivalent deterministic Turing machine

C) Every regular language is also a context-free language

D) Every subset of a recursively enumerable set is recursive

91. Which one of the following languages over the alphabet {0,1} is described by the regular expression: (0+1)*0(0+1)*0(0+1)*?

A) The set of all strings containing the substring 00.

B) The set of all strings containing at most two 0's.

C) The set of all strings containing at least two 0's.

D) The set of all strings that begin and end with either 0 or 1.

92. A minimum state deterministic finite automaton accepting the language $L = \{ w \mid w \in \{0,1\}^*$, number of 0s and 1s in w are divisible by 3 and 5, respectively$\}$ has

A) 15 states

B) 11 states

C) 10 states

D) 9 states

93. Consider the grammar shown below.

$S \rightarrow C\ C$

$C \rightarrow c\ C \mid d$

The grammar is

A) LL(1)

B) SLR(1) but not LL(1)

C) LALR(1) but not SLR(1)

D) LR(1) but not LALR(1)

94. In a binary max heap containing n numbers, the smallest element can be found in time

A) O(n)

B) O(logn)

C) O(log logn)

D) O(1)

95. To implement Dijkstra's shortest path algorithm on un-weighted graphs so that it runs in linear time, the data structure to be used is:

A) Queue

B) Stack

C) Heap

D) B-Tree

96. How many distinct binary search trees can be created out of 4 distinct keys?

A) 5

B) 14

C) 24

D) 42

97. Suppose $T(n) = 2T(n/2) + n$, $T(0) = T(1) = 1$. Which one of the following is FALSE?

A) $T(n) = O(n^2)$

B) $T(n) = \theta(n \log n)$

C) $T(n) = \Omega(n^2)$

D) $T(n) = O(n \log n)$

98. Let G(V, E) an undirected graph with positive edge weights. Dijkstra's single-source shortest path algorithm can be implemented using the binary heap data structure with time complexity:

A) O(| V |2)

B) O (| E | + | V | log | V |)

C) O (| V | log | V |)

D) O ((| E | + | V |) log | V |)

99. What is the number of swaps required to sort n elements using selection sort, in the worst case?

A) O(n)

B) O(n log n)

C) $O(n^2)$

D) $O(n^2 \log n)$

100. Which of the following statement(s) is / are correct regarding Bellman-Ford shortest path algorithm?

P. Always finds a negative weighted cycle, if one exists.

Q. Finds whether any negative weighted cycle is reachable from the source.

A) P only

B) Q only

C) both P and Q

D) Neither P nor Q