PUNJAB TECHNICAL UNIVERSITY
JALANDHAR

Max. Marks: 90 **Time: 90 Mins.**

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- ***Fill all the information in various columns, in capital letters, with blue/black ball point pen.***
- ***Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.***
- ***All questions are compulsory. No negative marking for wrong answers.***
- ***To attempt a question, make a tick mark (√) at the right option/answer.***
- ***Each question has only one right answer.***
- ***Questions attempted with two or more options/answers will not be evaluated.***

Subject *(Engg./Arch./Pharm./Mgmt./Sciences)* **ENGINEERING**

Discipline / Branch **CSE**

Name .....

Father's Name .....

Roll No. ..... Date : **10-07-2010**

Signature of Candidate .....

Signature of Invigilator .....

1. The probability that a leap year has 53 Sundays is

   (a) 1/7 (b) 2/7 (c) 5/7 (d) 6/7

2. Two girls have picked 10 Roses, 15 Sunflowers and 14 Daffodils. What is the number of ways they can divide the flowers among themselves ?

   (a) 1638 (b) 2100 (c) 2640 (d) None of these

3. The probability that it will rain today is 0.5. The probability that it will rain tomorrow is 0.6. The probability that it will rain either today or tomorrow is 0.7. What is the probability that it will rain today and tomorrow?

   (a) 0.3 (b) 0.25 (c) 0.35 (d) 0.4

4. Hyderabad suburban railway has 21 stations. Designating a ticket from station to another station as distinct type of ticket, calculate the number of types of tickets required for the railway service is

   (a) 441 (b) 421 (c) 420 (d) 210

5. Manish has to travel from A to D changing buses at stops B and C enroute. The maximum waiting time at either stop can be 8 minutes each, but any time of waiting up to 8 minutes is equally likely at both places. He can afford up to 13 minutes of total waiting time if he is to arrive at D on time. What is the probability the Manish will arrive late at D?

   (a) 8/13 (b) 13/14 (c) 119/128 (d) 9/128

6. In a group of 72 students, 47 have background in Electronics and 59 have background in Mathematics and 42 have background in both the subjects. How many students do not have background in any of the subjects?

   (a) 8 (b) 13 (c) 25 (d) 34

7. The binary relation r = {(1, 1), (2, 1), (2, 2), (2, 3), (2, 4), (3, 1), (3, 2), (3, 3), (3, 4)} on the set A = {1, 2, 3, 4} is

   (a) Reflexive, symmetric and transitive
   (b) Neither reflexive, nor irreflexive but transitive
   (c) Irreflexive, symmetric and transitive
   (d) Irreflexive and antisymmetric

8. The number of equivalence relations of the set {1, 2, 3, 4} is

   (a) 4 (b) 15 (c) 16 (d) 24

9. A relation R is defined on the set of positive integers as xRy if $2x + y \leq 5$. The relation R is
   I. Reflexive
   II. Symmetric
   III. Transitive

   (a) I only (b) II only (c) III only (d) I and II only

10. In a beauty contest, half the number of experts voted for Mr. A and two third voted for Mr. B. 10 voted for both and 6 did not vote for either. How many experts were there in all.

    (a) 18 (b) 36 (c) 24 (d) None of these

11. The number of ways to arrange the letters of the word CHEESE are

    (a) 120 (b) 240 (c) 720 (d) 6

12. Six teachers and six students have to sit round a circular table such that there is a teacher between any two students. The number of ways in which they can sit is

    (a) 6 ! * 6 ! (b) 5 ! * 6 ! (c) 5 ! * 5 ! (d) none of these

13. The minimum number of colours required to colour the vertices of a cycle with n nodes in such a way that no two adjacent nodes have the same colour is

(a) 2 (b) 3 (c) 4 (d) n – 2[n/2] +2

14. Let G be a graph with 100 vertices numbered 1 to 100. Two vertices i and j are adjacent if $|i - j| = 8$ or $|i - j| = 12$. The number of connected components in G is

(a) 8 (b) 4 (c) 12 (d) 25

15. In which of the following methods proper choice of initial value is more important ?

(a) Bisection method (b) False position
(c) Newton – Raphson (d) Bairsto method

16. Find a root of the equation $x^3-x-11=0$ correct to four decimals using bisection method.

(a) 2.3737 (b) 2.38388
(c) 2.3736 (d) None of these

17. Find out double(Repeated) root of
$4x^3-8x^2-3x+9=0$ by Newton – Raphson method.

(a) 1.4 (b) 1.5
(c) 1.6 (d) 1.55

18. Evaluate $_0^{\Pi}\int$Sin x dx by using Trapezoidal rule, taking 0 equal interval.

(a) 1.902 (b) 1.941
(c) 1.888 (d) 1.984

19. The order of the error is the Simpson's rule for numerical integeration with a step size h is

(a) h (b) h^2
(c) h^3 (d) h^4

20. The following grammar is

S → aαb | bαc | aB
S → aS | b
S → αbb | ab
bα → bdb | b

(a) context free (b) regular
(c) context sensitive (d) LR (k)

21. A PDM behaves like an FSM when the number of auxiliary memory it has, is

(a) 0 (b) 1
(c) 2 (d) none of these

22. Consider the following regular expression:

R= (ab | abb) * bbab

Which of the following strings is NOT in the set denoted by R ?

(a) abababb
(b) ababbabbbab
(c) abbab
(d) abbabbbab

23. Turing machine (TM) is most powerful, than FMS (Finite State Machine) because

(a) tape movement is confined to one direction
(b) it has no finite state
(c) it has capability to remember arbitrary-rely long sequences of input symbols
(d) none of these

24. Let Σ = { a, b, c, d, e, f }. The number of strings in Σ of length 4 such that no symbol is used more than once in a string is

(a) 35 (b) 360 (c) 49 (d)720

25. Can a DFA simulate NFA ?

(a) No (b) Yes (c) Sometimes (d) Depends on NFA

26. Consider the regular expression (0 + 1) (0 +1) ---- n times. The minimum state finite automation that recognizes the language represented by this regular expression contains

(a) n states
(b) n + 1 states
(c) n + 2 states
(d) none of these

27. Suppose a cache is 10 times faster than main memory, and suppose that the cache can be used 90 % of the time. How much speed up do we gain by using the cache

(a) 5.3 (b) 6.5 (c) 7.3 (d) 3.5

28. The decimal value of 0.25 is

(a) is equivalent to the binary value 0.1
(b) is equivalent to the binary value 0.0110
(c) is equivalent to the binary value 0.00111
(d) Can not be represented precisely in binary

29. The 2's complement representation of $(-539)_{10}$ in hexadecimal is

(a) ABE (b) DBC (c) DE5 (d) 9E7

30. A toggle operation cannot be performed using a single

(a) NOR gate
(b) AND gate
(c) NAND gate
(d) XOR gate

31. How many 4 digit even numbers have all four digits distinct ?

(a) 2240 (b) 2296 (c) 2620 (d) 4536

32. A 2MHz signal is applied to the input of a J-K flip-flop which is operating in the toggle mode. The frequency of the signal at the output is

(a) 1 MHz (b) 2 MHz (c) 4MHz (d) 8MHz

33. Which one of following Boolean expressions is not logically equivalent to all of the rest ?

(a) wxy' + wz' + wxyz + wy'z
(b) wx' + wy' + wyz'
(c) w + x + y' + z'
(d) wx + wy' + wz'

34. A 4- bit shift register can be made by using

(a) 3 JK flip- flop (b) 4 JK flip- flop
(c) 5 JK flip- flop (d) 8 JK flip- flop

35. A computer uses trinary system instead of the traditional binary syste. A 'n' bit string in the binary system will occupy

(a) 3 + n trinary digits (b) 2n/3 trinary digits
(c) n $\log_2 3$ trinary digits (d) n $\log_3 2$ trinary digits

36. Which of the following is/are true of the auto-increment addressing mode?
I . It is useful in creating self-relocating code
II. If it is included in an Instruction Set Architecture, then an additional ALU is required for effective address calculation
III.The amount of increment depends on the size of data item accessed

(a) I only (b) II only
(c) III only (d) II and III only

37. For inclusion to hold between two cache levels L1 and L2 in a multi-level cache hierarchy, which of the following are necessary ?
I. L1 must be a write-through cache
II. L2 must be a write-through cache
III. The associativity of L2 must be greater than that of L1
IV. The L2 cache must be at least as large as the L1 cache

(a) IV only (b) I and IV only
(c) I, III and IV only (d) I, II, III and IV

38. In an instruction execution pipeline, the earliest that the data TLB (Translation Lookaside Buffer) can be accessed is

(a) before effective address calculation has started
(b) during effective address calculation
(c) after effective address calculation has completed
(d) after data cache lookup has completed

39. A B-tree of order 4 is built from scratch by 10 successive insertions. What is the maximum number of node sphitting operations that may take place?

(a) 3 (b) 4
(c) 5 (d) 6

40. The recurrence equation

$T(1) = 1$
$T(n) = 2T(n-1) + n, n \geq 2$

evaluates to

(a) $2^{n+1} - n - 2$ (b) $2^n - n$
(c) $2^{n+1} - 2n - 2$ (d) $2^n + n$

41. Consider the following statements
Statement 1 : Constructor of base class executed first and then constructed of derived class.
Statement 2 : If a base class has constructors with arguments then it's not necessary for the derived class to have constructor.
Statement 3 : If the base class do not have default constructor, they must be explicitly invoked.
Statement 4 : Virtual base class constructor should be invoked first and then orderly invocation of constructors.
Statement 5 : The derived class need not have a constructor as long as base class has a no- argument constructor.

of these correct statements are

(a) 1, 2, 3 (b) 1,2,4,5
(c) 1, 3, 4, 5 (d) All statements are correct

42. If each node in a tree has value greater than every value in its left subtree and has value less than every value in its right subtree, the tree is known as

(a) complete tree (b) full binary ttree
(c) binary search tree (d) threaded tree

43. How many value can be held by an array A(-1..m, 1..m) ?

(a) m (b) m^2 (c) m(m+1) (d) m(m+2)

44. For a linear search in a array of n elements the time compkexity for best, worst and average case are …., … and …. respectively.

(a)O(n), O(1), and O(n/2) (b) O(1), O(n) and O(n/2)
(c) O/1, O(n) and O(n) (d) O(1), O(n) and (n-1/2)

45. What will be the value of x and y after execution of the following statement (C language) n = = 5; x = n++; y= -x;

(a) 5, 4 (b) 6, 5 (c) 6, 6 (d) 5, 5

46. A 3-ary tree in which every internal node has exactly 3 children. The number of leaf nodes in such a tree with 6 internal nodes will be

(a) 10 (b) 11 (c) 12 (d) 13

47. How can you make an e-mail link?

(a) <mail href + "xxx@y.com" > (b) <mail> xxx@y.com <mail>
(c) <a href = "mail to: xxx@y.com"> (d) <a mail href = "xxx@y.com">

48. Markup tags tell the web browser

(a) how to organize the page (b) how to display the page
(c) how to display message box on page (d) none of these

49. What is correct HTML for making a hyperlink?

a. < a url = "http://www.company.com">company.com <ja>
b. <a> http://www.company.com <ja>
c. < a href = " http://www.company.com">company <ja>
d. < a name = "http://www.company.com">company.com <(a)>

50. The <DIR> tag can have only

(a) 12 characters (b) 18 characters
(c) 22 characters (d) 24 characters

51. The web standard allows programmers on many different computer platforms to Dispersed format and display the information server. These programs are called

(a) Web Browsers (b) HTML
(c) Internet Explorer (d) None of these

52. A pseudo code is

a. a protocol used in data communication
b. an easy way to communicate the logic of a program, in English-like statements
c. a computer generated random number
d. a machine code

53. In a Decision tree

a. The root is drawn on the left and is the starting point on the decision sequence
b. The branch, to be followed, depends on the conditions and decisions, to be made
c. The nodes represent the conditions, with the right wise of tree listing the actions to be taken
d. All the above

54. Reverse video is a technique of

a. showing data with half brightness
b. showing data upside down on the screen
c. hiding confidential data on the screen
d. emphasizing data by reversing the foreground and background

55. Top-down programming is

a. a group of related fields
b. a map of the programmer's view of the data
c. an approach in which the top module are added from the highest level to the lowest level
d. a series or group of components that perform one or more operations of a more complex system

56. On a TCP connection, current congestion window size is Congestion Window = 4 KB. The window size advertised by the receiver is Advertise Window = 6 KB. The last byte sent by the sender is Last Byte Sent = 10240 and the last byte acknowledged by the receiver is LastByteAcked = 8192. The current window size at the sender is

(a) 2048 bytes (b) 4096 bytes
(c) 6144 bytes (d) 8192 bytes

57. In a communication network, a packet of length L bits takes link L1 with a probability of p_1 or link L2 with a probability of p_2. Link L1 and L2 have bit error probability of b_1 and b_2 respectively. The probability that the packet will be received without error via either L1 and L2 is

(a) $(1-b_1)^L p_1 + (1-b_2)^L p_2$
(b) $[1-(b_1+b_2)^L]p_1p_2$
(c) $(1-b_1)^L (1-b_2)^L p_1p_2$
(d) $1-(b_1^L p_1 + b_2^L p_2)$

58. Data transmitted on a link uses the following 2D parity scheme for error detection: Each sequence of 28 bits is arranged in a 4x7 matrix (rows r_0 through r_3, and columns d_7 through d_1) and is padded with a column d_0 and row r_4 of parity bits computed using the Even parity scheme. Each bit of column d_0 (respectively, row r_4) gives the parity of the corresponding row (respectively, column). These 40 bits are transmitted over the data link.

	d_7	d_6	d_5	d_4	d_3	d_2	d_1	d_0
r_0	0	1	0	1	0	0	1	**1**
r_1	1	1	0	0	1	1	1	**0**
r_2	0	0	0	1	0	1	0	**0**
r_3	0	1	1	0	1	0	1	**0**
r_4	**1**	**1**	**0**	**0**	**0**	**1**	**1**	**0**

The table shows data received by a receiver and has n corrupted nits. What is the minimum possible value of n?

(a) 1 (b) 2
(c) 3 (d) 4

59. A 2 Km long broadcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2×10^8 m/s. What is the minimum packet size that can be used on this network?

(a) 50 bytes (b) 100 bytes
(c) 200 bytes (d) None of these

60. The routing table of a router is shown below:

Destination	Subnet Mask	Interface
128.75.43.0	255.255.255.0	Eth0
128.75.43.0	255.255.255.128	Eth1
192.12.17.5	255.255.255.255	Eth3
Default		Eth2

On which interfaces will the router forward packets addressed to destinations 128.75.43.16 and 192.12.17.10 respectively?

(a) Eth1 and Eth2 (b) Eth0 and Eth2
(c) Eth0 and Eth3 (d) Eth1 and Eth3

61. Match the following:

P. SMTP	1. Application layer
Q. BGP	2. Transport layer
R. TCP	3. Data link layer
S. PPP	4. Network layer
	5. Physical layer

(a) P - 2, Q - 1, R - 3, S - 5
(b) P - 1, Q - 4, R - 2, S - 3
(c) P - 1, Q - 4, R - 2, S – 5
(d) P - 2, Q - 4, R - 1, S – 3

62. There are n stations in a slotted LAN. Each station attempts to transmit with a probability p in each time slot. What is the probability that ONLY one station transmits in a given time slot ?

(a) $np(1-p)^{n-1}$ (b) $(1-p)^{n-1}$
(c) $p(1-p)^{n-1}$ (d) $1-(1-p)^{n-1}$

63. In a token ring network the transmission speed is 10^7 bps and the propagation speed is 200 metres / μs. The 1 –bit delay in this network is equivalent to:
(a) 500 metres of cable.
(b) 200 metres of cable
(c) 20 metres of cable
(d) 50 metres of cable

64. Count to infinity is a problem associated with
(a) link state routing protocol.
(b) Distance vector routing protocol.
(c) DNS while resolving host name.
(d)TCP for congestion control.

65. Consider the three commands: PROMPT,HEAD and RCPT.
Which of the following options indicate a correct association of these commands with protocols where these are used?
(a) HTTP,SMTP,FTP
(b) FTP,HTTP,SMTP
(c) HTTP,FTP,SMTP
(d) SMTP,HTTP,FTP

66. A disk has 200 tracks (numbered 0 through 199). At a given time, it was servicing the request of reading data from track 120, and at the previous request, service was for track 90. the pending requests (in order of their arrival) are for track numbers.
30 70 115 130 110 80 20 25.
How many times will the head change its direction for the disk scheduling policies SSTF (Shortest Seek Time First) and FCFS (First Come First Serve)?
(a) 2 and 3 (b) 3 and 3
(c) 3 and 4 (d) 4 and 4

67. A process executes the following segment of code:

```
for(i=1; i<=n ; i++)
    fork ();
```

The number of new processes created is

(a) n (b) n(n+1)/2
(c) 2^n-1 (d) 3^n-1

68. In a particular Unix OS, each data block is of size 1024 bytes, each node has 10 direct data block addresses and three additional addresses: one for single indirect block, one for double indirect block and one for triple indirect block. Also, each block can contain addresses for 128 blocks. Which one of the following is approximately the maximum size of a file in the file system?

(a) 512 MB (b) 2 GB
(c) 8 GB (d) 16 GB

69. A user level process in Unix traps the signal sent on a Ctrl-C input, and has a signal handling routine that saves appropriate files before terminating the process. When a Ctrl-C input is given to this process, what is the mode in which the signal handling routine executes?

(a) kernel mode (b) super user mode
(c) privileged mode (d) user mode

70. For each of the four processes P1, P2, P3, and P4. The total size in kilobytes (KB) and the number of segments are given below.

Process	Total size (in KB)	Number of segments
P1	195	4
P2	254	5
P3	45	3
P4	364	8

The page size is 1 KB. The size of an entry in the page table is 4 bytes. The size of an entry in the segment table is 8 bytes. The maximum size of a segment is 256 KB. The paging method for memory management uses two-level paging, and its storage overhead is P. The storage overhead for the segmentation method is S. The storage overhead for the segmentation and paging method is T. What is the relation among the overheads for the different methods of memory management in the concurrent execution of the above four processes?

(a) P < S < T (b) S < P < T
(c) S < T < P (d) T < S < P

71. Processes P1 and P2 use critical_flag in the following routine to achieve mutual exclusion. Assume that critical_flag is initialized to FALSE in the main program.

```
get_exclusive_access ()
{       if (critical_flag ==FALSE)    {
          critical_flag = TRUE ;
                critical_region () ;
                critical_flag = FALSE;
        }
}
```

Consider the following statements.
(i) It is possible for both P1 and P2 to access critical_region concurrently.
(ii) This may lead to a deadlock.

Which of the following holds?

(a) (i) is false and (ii) is true
(b) Both (i) and (ii) are false
(c) (i) is true and (ii) is false
(d) Both (i) and (ii) are true

72. The address sequence generated by tracing a particular program executing in a pure demand paging system with 100 bytes per page is
0100, 0200, 0430, 0499, 0510, 0530, 0560, 0120, 0220, 0240, 0260, 0320., 0410.
Suppose that the memory can store only one page and if x is the address which causes a page fault then the bytes from addresses x to x + 99 are loaded on to the memory. How many page faults will occur?

(a) 0 (b) 4
(c) 7 (d) 8

73. In analyzing the compilation of PL/I program, the term "Machine independent" Optimization is associated with

(a) Recognition of basic syntactic constructs through reductions.
(b) Recognition of basic elements and creation of uniform symbols.
(c) Creation of more optimal matrix.
(d) Use of macro processor to producer more optimal assembly.

74. Which is a permanent database in the general model of compiler?

(a) Literal table (b) Identifier table
(c) Terminal table (d) Reduction

75. A relocatable program form is one which

(a) Cannot be made to execute in any area of storage other than the one designated for it at the time of its coding or translation.
(b) Consists of a program and relevant information for its relocation.
(c) Can itself perform the relocation of its address sensitive portions.
(d) All the above.

76. The term "residual error rate "refers to

(a) The probability that one or more errors will be detected when an error detection mechanism is used.
(b) The probability that one or more bit errors will occur regardless of whether we use error detection techniques.
(c) The probability that one or more errors will be undetected when an error detection scheme is in place. .
(d) The number of bits error per twenty four hours of continuous operation of an asynchronous 300 bps line.

77. A language L allows declaration of arrays whose sizes are not known during compilation. It is required to make efficient use of memory. Which one the following is true?

(a) A compiler using static memory allocation can be written for L
(b) A compiler cannot be written for L; an interpreter must be used.
(c) A compiler using dynamic memory allocation can be written for L
(d) None of the above

78. Correctly match the following pairs and determine the answer from the codes given below:

(A) Activation record	(1) Linking loader
(B) Location counter	(2) Garbage collection
(C) Reference counts	(3) Subroutine call
(D) Address relocation	(4) Assembler

Codes:

	A	B	C	D
(a)	3	4	1	2
(b)	4	3	1	2
(c)	4	3	2	1
(d)	3	4	2	2

79. Type checking is normally done during

(a) Lexical analysis (b) Syntax analysis
(c) Syntax directed translation (d) Code optimization

The following three questions are based upon the below information in the table

RID	Age	Income	Student	Credit_rating	Class:buys_computer
1	Youth	High	No	Fair	No
2	Youth	High	No	Excellent	No
3	Middle_aged	High	No	Fair	Yes
4	Senior	Medium	No	Fair	Yes
5	Senior	Low	Yes	Fair	Yes
6	Senior	Low	Yes	Excellent	No
7	Middle_aged	Low	Yes	Excellent	Yes
8	Youth	Medium	No	Fair	No
9	Youth	Low	Yes	Fair	Yes
10	Senior	Medium	Yes	Fair	Yes
11	Youth	Medium	Yes	Excellent	Yes
12	Middle_aged	Medium	No	Excellent	Yes
13	Middle_aged	High	Yes	Fair	Yes
14	Senior	Medium	No	Excellent	No

80. In the table a training set, D is shown and each attribute is discrete valued. What will be the excepted information needed to classify a tuple in training set D, if the tuples are partitioned according to age?

(a) 1.649 bits
(b) 0.953 bits
(c) 0.246 bits
(d) 0.694 bits

81. Which one is the splitting attribute in above given table?

(a) income
(b) age
(c) credit_rating
(d) student

82. What will be the gain ratio for the attribute income in the above table ?

(a) 0.210
(b) 0.056
(c) 0.524
(d) 0.031

83. If a numeric field has a width of 5.2, then the value of the field could be

(a) 23.10
(b) 121.8
(c) 143.87
(d) both (a) and (b)

84. Varsatile report generators can provide

(a) columnar totals
(b) subtotals
(c) calculations
(d) all of these

85. Which of the following statements is true when structure of database file with 20 records is modified ?

(a)? EOF ( ) Prints. T
(b) ? BOF ( ) Prints. F
(c))? BOF ( ) Prints. T
(d) ? EOF ( ) Prints. F

86. Given relation r (w, x) and s (y, z), the result of select distinct w, x from r, s is guaranteed to be the same as r, provided:

(a) r has no duplicates and s is non-empty
(b) r and s have no duplicates
(c) s has no duplicates and r is non-empty
(d) r and s have the same number of tuples

87. which of the following definition generates the same language as L, where

L= {Xn Yn, n≥1}
I. E → xEY | xY
II. xY | x+xYY+
III. x+y+

(a) I only
(b) I and II
(c) II and III
(d) II only

88. Consider a relation geq which represents "greater than or equal to", that is (x, y) ε geq only if y>=x. Create table geq(lb integer not null ub integer not null primary key lb foreign key (ub) references geq on delete cascade) which of the following is possible if a tuple(x, y) is deleted?

(a) a tuple (z ,w) with z > y is deleted
(b) a tuple (z ,w) with z > x is deleted
(c) a tuple (z, w) with w<x is deleted
(d) the deletion of (x, y) is prohibited

89. Consider the Join of a relation R with a relation S. If R has m tuples and S has n tuples, then the maximum and minimum sizes of the Join respectively are:

(a) m + n and 0
(b) mn and 0
(c) m + n and | m – n |
(d) mn and m + n

90. The relational algebra expression equivalent to the following tuple calculus expression
{t \ t ε r Λ (t[A] = 10 Λ t[B] = 20)} is :

(a) $\sigma_{(A=10 \text{ v } B=20)}$ (r)
(b) $\sigma_{(A=10)}$ (r) U $\sigma_{(B=20)}$ (r)
(c) $\sigma_{(A=10)}$ (r) ∩ $\sigma_{(B=20)}$ (r)
(d) $\sigma_{(A=10)}$ (r) - $\sigma_{(B=20)}$ (r)