



# 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.

Stream (Engg./Arch./Pharm./Mgmt./App.Sci./Life Sci.)

**Engineering**

Discipline

**Computer Science / Information Technology**

Name

Father's Name

Roll No.

Date: **15-01-2011**

Signature of Candidate

Signature of Invigilator

Q. 1 Which form of reasoning is the process of drawing a specific conclusion from a set of premises?

- (a) rationalism .....
- (b) deductive reasoning .....
- (c) inductive reasoning .....
- (d) probabilistic .....

Q. 2 Which scientific method is a top-down or confirmatory approach?

- (a) Deductive method .....
- (b) Inductive method .....
- (c) Hypothesis method .....
- (d) Pattern method .....

Q. 3 Which of the following best describes quantitative research?

- (a) the collection of nonnumerical data .....
- (b) an attempt to confirm the researcher's hypotheses .....
- (c) research that is exploratory .....
- (d) research that attempts to generate a new theory .....

Q. 4 Which correlation is the strongest?

- (a) +.10 .....
- (b) -.95 .....
- (c) +.90 .....
- (d) -1.00 .....

Q. 5 The statement of purpose in a research study should:

- (a) Identify the design of the study .....
- (b) Specify the type of people to be used in the study .....
- (c) Identify the intent or objective of the study .....
- (d) Describe the study .....

Q. 6 A review of the literature prior to formulating research questions allows the researcher to do which of the following?

- (a) To become familiar with prior research on the phenomenon of interest .....
- (b) To identify potential methodological problems in the research area .....
- (c) To develop a list of pertinent problems relative to the phenomenon of interest .....
- (d) All of the above .....

Q. 7 IRB is an acronym for which of the following?

- (a) Internal Review Board .....
- (b) Institutional Rating Board .....
- (c) Institutional Review Board .....
- (d) Internal Request Board .....

Q. 8 The act of publishing the same data and results in more than one journal or publication refers to which of the following professional issues:

- (a) Partial publication .....
- (b) Duplicate publication .....
- (c) Deception .....
- (d) Full publication .....

Q. 9 Which of the following approaches taken by people to resolve ethical issues is the primary approach used by the federal government and most professional organizations?

- (a) Deontological approach.....
- (b) Ethical skepticism.....
- (c) Utilitarianism.....
- (d) None of the above.....

Q. 10 Which scale is the simplest form of measurement?

- (a) Nominal.....
- (b) Ordinal.....
- (c) Interval.....
- (d) Ratio.....

Q. 11 Which type of reliability refers to the consistency of a group of individuals' scores on two equivalent forms of a test designed to measure the same characteristic?

- (a) Split-half.....
- (b) Test-retest.....
- (c) Split-forms.....
- (d) Equivalent forms.....

Q. 12 A census taker often collects data through which of the following?

- (a) Standardized tests.....
- (b) Interviews.....
- (c) Secondary data.....
- (d) Observations.....

Q. 13 Which of the following would generally require the largest sample size?

- (a) Cluster sampling.....
- (b) Simple random sampling.....
- (c) Systematic sampling.....
- (d) Proportional stratified sampling.....

Q. 14 The use of multiple data sources to help understand a phenomenon is one strategy that is used to promote qualitative research validity. Which of the following terms describes this strategy?

- (a) Data matching.....
- (b) Pattern matching Data triangulation.....
- (c) Data triangulation.....
- (d) Data feedback.....

Q. 15 What is the median of the following set of scores?

18, 6, 12, 10, 14 ?

- (a) 10.....
- (b) 14.....
- (c) 18.....
- (d) 12.....

Q. 16 The denominator of the z-score formula is:

- (a) The standard deviation.....
- (b) The difference between a score and the mean.....
- (c) The range.....
- (d) The mean.....

Q. 17 If a test was generally very easy, except for a few students who had very low scores, then the distribution of scores would be:

- (a) Positively skewed.....
- (b) Negatively skewed.....
- (c) Not skewed at all.....
- (d) Normal.....

Q.18 \_\_\_\_\_ are used when you want to visually examine the relationship between two quantitative variables.

- (a) Bar Charts.....
- (b) Pie Charts.....
- (c) Line graphs.....
- (d) Scatterplots.....

Q. 19 In looking at the relationships between coding categories, the relation, "X is a place in Y; X is part of Y" in Spradley's taxonomy of semantic relations is labeled:

- (a) Spatial.....
- (b) Rationale.....
- (c) Means-end.....
- (d) Strict inclusion.....

Q. 20 As a general rule, researchers tend to use \_\_\_\_\_ percent confidence intervals.

- (a) 99%.....
- (b) 95%.....
- (c) 50%.....
- (d) 100%.....

Q. 21 Sparse matrices have

- (a) many zero elements.....
- (b) all upper diagonal elements as zeros.....
- (c) all lower diagonal elements as zeros.....
- (d) None of the above.....

Q. 22 Let  $\alpha, \beta$  are the roots of the equation  $(x - a)(x - b) = c$  with  $c \neq 0$ . Then the roots of the equation  $(x - \alpha)(x - \beta) + c = 0$  are

- (a)  $a, b$ .....
- (b)  $a, c$ .....
- (c)  $b, c$ .....
- (d)  $a, b, c$ .....

Q. 23  $A \cup B = A \cap B$  if .....

- (a)  $A = \phi$  .....
- (b)  $B = \phi$  .....
- (c)  $A = B$  .....
- (d)  $A \subset B$  .....

Q. 24 Enumerate the elements in  $\{x \in R | x^2 - 3x + 2 = 0\}$  .....

- (a) {2, 1} .....
- (b) {3, 4} .....
- (c) {5, 6} .....
- (d) {1, -1} .....

Q. 25 The truth table of  $(p \wedge q) \vee (q \wedge r) \vee (v \wedge p)$  is .....

- (a) 00010111 .....
- (b) 11101000 .....
- (c) 01010101 .....
- (d) none of the above .....

Q. 26  $(1217)_8$  is equivalent to .....

- (a)  $(321)_6$  .....
- (b)  $(5210)_5$  .....
- (c)  $(22032)_4$  .....
- (d) None of the above .....

Q. 27 The minimum number of 2-input NAND gates required to implement the function

$$F = (x + \bar{y})(z + w)$$

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

Q. 28 What is the 16 bit signed 2's complement representation of number (-435)? .....

- (a) FE4D H .....
- (b) 81B3 H .....
- (c) FFB3 H .....
- (d) None of these .....

Q. 29 The minimum number of edges in a connected cyclic graph of n vertices is .....

- (a) n-1 .....
- (b) n .....
- (c) n+1 .....
- (d) None of these .....

Q. 30 The sum m of the degree of the vertices of G where  $V(G) = \{A, B, C, D\}$  and  $E(G) = [\{A, B\}, \{A, C\}, \{B, D\}, \{C, D\}]$  .....

- (a) 6 .....
- (b) 8 .....
- (c) 10 .....
- (d) 14 .....

Q. 31 Which of the following logic expression is incorrect? .....

- (a)  $1 \oplus 0 = 1$  .....
- (b)  $1 \oplus 1 \oplus 0 = 1$  .....
- (c)  $1 \oplus 1 \oplus 1 = 1$  .....
- (d)  $1 \oplus 1 = 0$  .....

Q. 32 The simultaneous equations on Boolean variables x, y, z and w

$$x + y + z = 1$$

$$xy = 0$$

$$xz + w = 1$$

$$xy + z'w' = 0$$

have the following solution for x, y, z and w respectively.

- (a) 0 1 0 0 .....
- (b) 1 1 0 1 .....
- (c) 1 0 1 1 .....
- (d) 1 0 0 0 .....

Q. 33 Given the following K-map, which one of the following represents the minimal SOP of the map?

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

- (a)  $xy + y'z$  .....
- (b)  $wx'y' + xy + xz$  .....
- (c)  $w'x + y'z + xy$  .....
- (d)  $xz + y$  .....

Q. 34 In serial data transmission, every byte of data is padded with a '0' in the beginning and one or two '1's at the end of byte because .....

- (a) Receiver is to be synchronized for byte reception .....
- (b) Receiver recovers lost '0' and '1's .....
- (c) Padded bits are useful in parity computation .....
- (d) None of these .....

Q. 35 Assuming all the numbers are in 2's complement representation, which of the following is divisible by 1111011.....

- (a) 11011011 .....
- (b) 11100100 .....
- (c) 11010111 .....
- (d) 11100111 .....

Q. 36 A single instruction to clear the lower four bits of the accumulator in 8085 assembly language is

- (a) XRI 0F H .....
- (b) ANI F0 H .....
- (c) XRI F0 H .....
- (d) ANI 0F H .....

Q. 37 Booth's coding in 8 bits for  $(-57)_{10}$  is.....

- (a) 0-100+1000 .....
- (b) 0-100+100-1 .....
- (c) 0-1+100-10+1 .....
- (d) 00-10+100-1 .....

Q. 38 A computer uses a floating point representation comprising a signed magnitude fractional mantissa and an excess-16 base -8 exponent. What decimal number is represented by a floating point number whose exponent is 10011 and mantissa 101000 and the sign bit is set?

- (a) -6250 .....
- (b) -20480 .....
- (c) -320 .....
- (d) -0.00122 .....

Q. 39 FFFF will be the last memory location in a memory of size .....

- (a) 60 K .....
- (b) 16 K .....
- (c) 32 K .....
- (d) None of these .....

Q. 40 The number of columns is a state table for a sequential circuit with 'm' flip-flops and 'n' inputs is

- (a) m+n .....
- (b) m+2n .....
- (c) 2m+n .....
- (d) 2m+2n .....

Q. 41 The worst case time complexity to search an element in a sorted list of 'N' elements is

- (a)  $O(1)$  .....
- (b)  $O(\log_2 N)$  .....
- (c)  $O(N)$  .....
- (d)  $O(N \log_2 N)$  .....

Q. 42 The number of possible ordered trees with three nodes is .....

- (a) 6 .....
- (b) 8 .....
- (c) 10 .....
- (d) 12 .....

Q. 43 Postfix equivalent of the prefix  $*+ab-cd$  is

- (a)  $ab+cd-*$  .....
- (b)  $abcd+*$  .....
- (c)  $ab+cd*-$  .....
- (d)  $ab+-cd*$  .....

Q. 44 An adjacency matrix representation of graph cannot contain .....

- (a) nodes .....
- (b) edges .....
- (c) direction of edges .....
- (d) parallel edges .....

Q. 45 Algorithm that solves the all-pair shortest path problem is.....

- (a) Dijkstra's algorithm .....
- (b) Floyd's algorithm .....
- (c) Prim's algorithm .....
- (d) Warshall's algorithm .....

Q. 46 If the memory for the run time stack is only 150 words, how big can N be for computing Factorial(N) before encountering stack overflow?.....

- (a) 15 .....
- (b) 24 .....
- (c) 66 .....
- (d) 150 .....

Q. 47 Let A be a sequence of 9 distinct integers sorted in ascending order. How many distinct pair sequences, B and C are there such that (i) each is sorted in ascending order; (ii) B has 4 and C has 5 elements, and (iii) the result of merging B and C gives A?

- (a) 2 .....
- (b) 18 .....
- (c) 405 .....
- (d) 512 .....

Q. 48 The best data structure to check whether an arithmetic expression has balanced parenthesis is a....  
 (a) queue.....  
 (b) stack.....  
 (c) tree.....  
 (d) list.....

Q. 49 The number of leaf nodes in a rooted tree of  $n$  nodes, with each node having 0 or 3 children is .....  
 (a)  $n/2$ .....  
 (b)  $(n-1)/3$ .....  
 (c)  $(n-1)/2$ .....  
 (d)  $(2n+1)/3$ .....

Q. 50 A 4-stage pipeline has the stage delays as 150, 120, 160 and 140 nanoseconds respectively. Registers that are used between the stages have a delay of 5 nanoseconds each. Assuming constant clocking rate, the total time taken to process 1000 data items on this pipeline will be?.....  
 (a) 120.4  $\mu$ s.....  
 (b) 160.5  $\mu$ s.....  
 (c) 165.5  $\mu$ s.....  
 (d) 590.0  $\mu$ s.....

Q. 51 The clock interrupt handler on a computer requires 2 ms per clock tick. The clock runs at 60 Hz. What percent of CPU is devoted to clock?.....  
 (a) 1.2 %.....  
 (b) 7.5 %.....  
 (c) 12 %.....  
 (d) 18.5 %.....

Q. 52 What are the eigen values of the following 2x2 matrix?

$$\begin{bmatrix} 2 & -1 \\ -4 & 5 \end{bmatrix}$$

(a) -1 and 1.....  
 (b) 1 and 6.....  
 (c) 2 and 5.....  
 (d) -1 and 4.....

Q. 53 Consider a direct mapped cache of size 8KB with block size of 32 bytes. The CPU generate 24 bit addresses. The number of bits needed for cache indexing and the number of tag bits are respectively:..  
 (a) 13, 12.....  
 (b) 8, 11.....  
 (c) 5, 12.....  
 (d) 13, 11.....

Q. 54 The order in which operands are evaluated in an expression is predictable if the operator is  
 (a) \*.....  
 (b) +.....  
 (c) %.....  
 (d) &&.....

Q. 55 the value of the automatic variable that is declared but not initialized will be:  
 (a) 0.....  
 (b) -1.....  
 (c) garbage.....  
 (d) None of the above.....

Q. 56 Arrays are passed as arguments to a function by.....  
 (a) value.....  
 (b) reference.....  
 (c) both (a) and (b) above.....  
 (d) None of the above.....

Q. 57 If variable 'c' is initialized to 10, how many times will the following loop be executed?  

```
while(c)
    printf("PTU");
    c--;
```

 (a) 1.....  
 (b) 10.....  
 (c) 9.....  
 (d) None of the above.....

Q. 58 A class template can declare .....  
 (a) global data members.....  
 (b) constant data members.....  
 (c) static data members.....  
 (d) both (a) and (c) above.....

Q. 59 To overload a postfix ++ for Test class, an appropriate function header is .....  
 (a) Test&Test::operator++(int).....  
 (b) Test&Test::operator++(Test&num).....  
 (c) Test&Test::operator++(.).....  
 (d) Test::operator++(Test&num).....

Q. 60 To use a template class member function, use the \_\_\_\_\_ with the instantiation. ....  
 (a) scope resolution operator.....  
 (b) dot operator.....  
 (c) class definition.....  
 (d) key word template.....

Q. 61 If a container classes are carefully constructed, then these tools are available to work with the structures that are not .....

- (a) valid without container classes.....
- (b) programmer defined.....
- (c) type-specific.....
- (d) public.....

Q. 62 The following program results in

```
main( )
{printf(“%u,”main);} .....
```

- (a) printing of starting address of function main( ).....
- (b) printing of garbage value.....
- (c) an execution error.....
- (d) an infinite loop.....

Q. 63 Which of following system calls reads 8 bits form the standard input using the **ptr** as a pointer to buffer area?.....

- (a) read ( 0, ptr, 8).....
- (b) read (0, ptr, 1).....
- (c) read ( 1, ptr, 8).....
- (d) read ( 1, ptr, 1).....

Q. 64 In a hypothetical programming language, all operators have equal precedence and associate to the left. In this language, the expression  $5 \times 3 - 2 - 1 \times 2$  evaluates to .....

- (a) 15.....
- (b) 11.....
- (c) 8.....
- (d) 20.....

Q. 65 Let elements a, b belong to group X. If  $O(b)$  is 2, then  $O(aba^{-1})$  is.....

- (a) 10.....
- (b) 8.....
- (c) 4.....
- (d) 2.....

Q. 66 What is minimum number of weights that can measure 1, 2, 3, 4, 5, 6, 7 and 8 kg?.....

- (a) 2.....
- (b) 3.....
- (c) 4.....
- (d) 5.....

Q. 67 At a particular time of computation, the value of a counting semaphore is 7. Then 20 P operations and ‘x’ V operations were completed on this semaphore. If the final value of the semaphore is 5, ‘x’ will be .....

- (a) 15.....
- (b) 18.....
- (c) 27.....
- (d) 13.....

Q. 68 The first-fit, best-fit and worst-fit algorithm can be used for.....

- (a) contiguous allocation of memory.....
- (b) linked allocation of memory.....
- (c) indexed allocation of memory.....
- (d) All of the above.....

Q. 69 Consider a system having ‘s’ resources of the same type. These resources are shared by three processes A, B, and C, which have the peak time demands of 3, 4, 6 respectively. The minimum value of ‘s’ that ensures that deadlock will never occur is ..

- (a) 11.....
- (b) 12.....
- (c) 13.....
- (d) 14.....

Q. 70 Which of the following scheduling algorithm has minimum average waiting time?.....

- (a) FCFS.....
- (b) SJF.....
- (c) Round-Robin.....
- (d) Priority.....

Q. 71 When an interrupt occurs, an operating system

- (a) ignores the interrupt.....
- (b) always changes the state of the interrupted process after processing the interrupt.....
- (c) always resumes the execution of the interrupted process after processing the interrupt .....
- (d) may change the state of the interrupted process to “blocked” and schedule another process.....

Q. 72 If  $a$  is a terminal and  $S, A, B$  are three non terminals, then which of the following are regular grammars? .....

- (a)  $S \rightarrow \epsilon$   
 $A \rightarrow aS \mid b$  .....
- (b)  $A \rightarrow aB \mid a$   
 $B \rightarrow bA \mid b$  .....
- (c)  $A \rightarrow Ba \mid Bab$  .....
- (d)  $A \rightarrow abB \mid aB$  .....

Q. 73 Which of the following symbol table implementation is best suited if access time is to be minimum? .....

- (a) Linear List .....
- (b) Search Tree .....
- (c) Hash Table .....
- (d) Self organization List .....

Q. 74 Choose the function that is/are periodic .....

- (a)  $f(x) = x - [x]$  where  $[x]$  stands for greatest integer  $\leq x$  .....
- (b)  $f(x) = |\cos(x)|$  .....
- (c)  $f(x) = \sin(1/x)$ ; if  $x \neq 0$ ; otherwise .....
- (d) both (a) and (b) .....

Q. 75 Which of the following graphical transformations are non-commutative? .....

- (a) Linear followed by scaling .....
- (b) Linear followed by rotation .....
- (c) scaling followed by rotation .....
- (d) None of the above .....

Q. 76 The number of sub-strings (of all lengths) that can be formed from a character string of length  $n$  is ...

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

Q. 77 Provide the best matching between the entries in two columns given in the table below:

I.	Proxy server	a.	Firewall
II.	KaZa, DC++	b.	Caching
III.	SLIP	c.	P2P
IV.	DNS	d.	PPP

- (a) I-a, II-d, III-c, IV-b .....
- (b) I-b, II-d, III-c, IV-a .....
- (c) I-a, II-c, III-d, IV-b .....
- (d) I-b, II-c, III-d, IV-a .....

Q. 78 In spiral model of software development, the primary determinant in selecting activities in each iteration is .....

- (a) Iteration size .....
- (b) Cost .....
- (c) Adopted process .....
- (d) Risk .....

Q. 79 Given relations  $R(w, x)$  and  $S(y, z)$ , the result of

SELECT DISTINCT  $w, x$   
FROM  $R, S$

is guaranteed to be the same as  $R$ , if .....

- (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 .....

Q. 80 Given the functional dependencies  $X \rightarrow W; X \rightarrow Y; Y \rightarrow Z$  and  $Z \rightarrow PQ$  which of the following does not hold good?

- (a)  $X \rightarrow Z$  .....
- (b)  $W \rightarrow Z$  .....
- (c)  $X \rightarrow WY$  .....
- (d) None of the above .....

Q. 81 If  $P$  and  $Q$  are the predicates and  $P$  is the relational algebra expression, then which of the following equivalence are valid? .....

- (a)  $\sigma_P(\sigma_Q(e)) = \sigma_Q(\sigma_P(e))$  .....
- (b)  $\sigma_P(\sigma_Q(e)) = \sigma_{P \wedge Q}(e)$  .....
- (c)  $\sigma_Q(\sigma_P(e)) = \sigma_{P \wedge Q}(e)$  .....
- (d) All of the above .....

Q. 82 Assume transaction  $A$  holds a shared lock  $L$ . If transaction  $B$  also requests for a shared lock  $L$ , it will

- (a) result in a deadlock situation .....
- (b) immediately be granted .....
- (c) immediately be rejected .....
- (d) be granted as soon as it is released by  $A$  .....

Q. 83 The maximum data rate of a channel of 3000Hz bandwidth and SNR of 30 dB is

- (a) 15,000 bps.....
- (b) 60,000 bps.....
- (c) 30,000 bps.....
- (d) 3,000 bps.....

Q. 84 A router has the following routing table

Destination	Mask	Interface
142.15.0.0	255.255.0.0	eth0
142.15.64.0	255.255.224.0	eth1
142.15.75.0	255.255.255.0	eth2
142.15.75.64	255.255.255.224	eth3

A packet having a destination address 142.15.75.120 arrives at the router. On which interface will it be forwarded to?

- (a) eth0.....
- (b) eth1.....
- (c) eth2.....
- (d) eth3.....

Q. 85 In a sliding window ARQ scheme, the transmitter's window size is N and receiver's window size is M. The minimum number of distinct sequence numbers required to ensure correct operation of this scheme is.....

- (a)  $\min(M, N)$ .....
- (b)  $\max(M, N)$ .....
- (c)  $M+N$ .....
- (d)  $MN$ .....

Q. 86 Assuming that for a given network layer implementation, connection establishment overhead is 100 bytes and disconnection overhead is 28 bytes. What would be minimum size of packet the transport layer needs to keep up, if it wishes to implement a datagram service above network layer and need to keep its overhead to a maximum of 12.5%. (Ignore transport layer overhead.).....

- (a) 512 bytes.....
- (b) 768 bytes.....
- (c) 1152 bytes.....
- (d) 1024 bytes.....

Q. 87 baud means.....

- (a) the number of bits transmitted per unit time.....
- (b) the number of bytes transmitted per unit time.....
- (c) the rate at which the signal changes.....
- (d) None of the above.....

Q. 88 The minimum frame size required for a CSMA/CD based computer network running at 1 Gbps on a 200 m cable with link speed of  $2 \times 10^8$  m/s is.....

- (a) 125 bytes.....
- (b) 250 bytes.....
- (c) 500 bytes.....
- (d) None of the above.....

Q. 89 Assume a system having two CPUs, each executing different programs. At the same time one of the CPU's tries to increment a variable  $x$ , while the other CPU tries to decrement the same  $x$ . The final value of  $x$  can never be

- (a) its original value.....
- (b) its original value + 1.....
- (c) its original value -1.....
- (d) None of the above.....

Q. 90 Let M be a node that represents a if-then-else node in a Program Graph. Let the number of paths from its if part to end part node is  $y$ , and from else part to the end node is  $z$ . If the number of paths from the start node to node M is  $x$ , then total number of paths through M is.....

- (a)  $x(y + z)$ .....
- (b)  $xz + y$ .....
- (c)  $x + y + z$ .....
- (d)  $xy + z$ .....