CODE: CZ

M.Tech. Common Entrance Test, PGCET – 2010

Mathematics and Computer Science

Time: 2 Hours | Max. Marks: 100

Read the following instructions before answering the test

i) Write / Darken the particulars of your identity, Test Seat Number and affix your signature on the OMR Response Sheet before the start of the test.

ii) All Questions have multiple choices of answers, of which only one is correct.

iii) Mark the correct answer by completely darkening only one oval against the Question number using Black Ink Ball Point pen only.

iv) There will be no negative evaluation with regard to wrong answers. Marks will not be awarded if multiple answers are given.

v) Do not make any stray mark on the OMR Response sheet. For rough work, use blank page on the question paper.

vi) Taking the question paper out of the test hall is permitted only after the full duration of the test.

vii) Use of only non-programmable calculator is permitted.

viii) START ANSWERING ONLY AT THE SPECIFIED TIME WHEN THE INVIGILATOR GIVES INSTRUCTIONS.

MARKS DISTRIBUTION

PART – I	50 Questions :	50 x 1 = 50 Marks
PART – II	25 Questions :	25 x 2 = 50 Marks
		Total = 100 Marks

Questions

Part I (one mark each) **50 x 1 = 50 marks**

1. One of the main reasons for the frequent occurrences of second order differential equations in physical sciences is ----------

a. presence of Maxwell's equations
b. presence of Newton's laws
c. presence of arbitrary constants
d. presence of equation of maxima or minima.

2. If V(x) is a function of x and r is a constant then, $\frac{1}{D-r}V$ = ...

where D is the differential operator.

a. $e^{-rx}\int e^{rx}V\,dx + ce^{-rx}$

b. $e^{rx}\int e^{-rx}V\,dx + ce^{rx}$

c. $e^{rx}\int e^{-rx}\frac{1}{V}\,dx + ce^{rx}$

d. $e^{-rx}\int e^{rx}\frac{1}{V}\,dx + ce^{rx}$

3. The solution of the differential equation

$\left(y - x\frac{dy}{dx}\right) = a\left(y^2 + \frac{dy}{dx}\right)$ is ----------

a. $(x + a)(ay + 1) = cy$
b. $(x + a)(ay - 1) = cy$
c. $(x - a)(ay - 1) = cy$
d. $(x - a)(ay + 1) = cy$

4. The man rows with the velocity v across a stream flow. The tangent of the path of his movement makes an angle ---------- with respect to his rowing and stream flow direction.

a. 90^0
b. less than 90^0
c. more than 90^0
d. 0^0

5. Different types of curves like a pair of straight lines, circle, parabola, ellipse and hyperbola are categorized as conics because they can be generated from intersection of a plane with ----------

a. double right circular cone with common vertex & axis
b. a single right circular cone
c. a curve
d. another plane

6. The conic is symmetric with respect to an axis, if equation of the conic contains all ..... .

a. even powers of coordinate value/s of the axis
b. even powers of coordinate value/s of the other axis
c. odd powers of coordinate value/s of the axis
d. odd powers of coordinate value/s of the other axis

7. Laplace transform is a transform that converts ---------- and ---------- into multiplication and division by s operator

a. addition, subtraction
b. integration, differentiation
c. subtraction, addition
d. differentiation, integration

8. The radius of curvature of concave upwards curve is

a. zero
b. positive
c. negative
d. denominator dependent

9. The transition curve of a railway track has the shape of cubical parabola $y = \frac{2}{3} x^3$. The rate at which a car on this track is changing its direction, when it is passing through the point (3, 18) is ----------

a. 0.2 radians/unit length
b. 0.02 radians/unit length
c. 0.002 radians/unit length
d. 0.0002 radians/unit length

10. A and B are two candidates seeking admission to a course. The probability of A gets selected is 0.5 and the probability that both A & B get selected is at the most 0.3 . Then the probability of B gets selected is at the most ----------

a. 0.9
b. 0.3
c. 0.6
d. 0.8

11. A condenser of capacity c is charged through a resistance R by a steady voltage V. The charge on the plate is $q = cV\left(1 - e^{-\frac{t}{Rc}}\right)$. Therefore the current i is given by ----------

a. $i = Vc\ e^{\frac{t}{Rc}}$
b. $i = \frac{V}{R}\ e^{-\frac{t}{Rc}}$
c. $i = Vc\ e^{-\frac{t}{Rc}}$
d. $i = \frac{V}{R}\ e^{\frac{t}{Rc}}$.

12. The cosine of the angle between the two planes $2x + y + 3z - 1 = 0$ and $3x - y + 2z + 4 = 0$ is ----------

a. $\frac{-11}{14}$
b. $\frac{11}{14}$
c. $\frac{1}{14}$
d. $\frac{13}{14}$

13. At the maximum or minimum point, the tangent to the curve is horizontal. However, the -------- differs at these points.

a. direction of the tangent
b. derivative of the tangent
c. integration of the tangent
d. size of the tangent

14. The angle between the radius vector and the tangent to the cardioide $r = a\,(1 + \cos\theta)$ at $\theta = \frac{\pi}{2}$ is ----------.

a. $\frac{\pi}{4}$
b. $\frac{\pi}{2}$
c. $\frac{3\pi}{4}$
d. π

15. The asymptote to the curve is a straight line that meets the curve at/on .....

a. Origin
b. x- axis
c. y-axis
d. infinity.

16. How many ways the letters of the word 'KARNATAKA' can be organized to form different strings.

a. 315
b. 1260
c. 3780
d. 7560

17. A question paper contains two sections, each containing 4 questions. The candidate needs to answer five questions choosing at least one from each section. How many options of question combinations are available to him/her?

a. 26
b. 34
c. 44
d. 56

18. If $f(x) = \sin log_{10}\left(\frac{\sqrt{4-x^2}}{1-x}\right)$ then the domain of x is in the range of ---

---

a. $[-2, 2]$
b. $[0, 1]$
c. $[-2, -1]$
d. $[-2, 1]$

19. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$. Then the value of $\begin{bmatrix} 1 & 1 & -1 \\ 1 & -1-\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^4 \end{bmatrix}$ is equal to

---

a. 3ω
b. $-3(2\omega + 1)$
c. $3\omega^2$
d. $3(1 - 2\omega)$

20. Can it be possible to transform the addition of two matrices (of course of the same order) into multiplication i. e. concatenation of matrices.

a. Yes, it is possible without any constraints
b. It is possible only if the matrices are mapped to homogeneous coordinates matrices
c. No, it is not possible
d. It may be, but depends on the values involved.

21. ---------- is a tautology.

a. $p \vee \square q \rightarrow p \wedge q$
b. $p \wedge \text{'}q \rightarrow p \vee \square q$
c. $\sim p \vee \square q \rightarrow p \wedge q$
d. $\sim q \vee \square p \rightarrow p \wedge q$

22. The number of elements in the power set of the set $A = \{1, 2, 2, 3, 3, 3, 4, 4, 4, 4, 5, 6, 7, 8, 9\}$ are ----------.

a. 3840
b. 7680
c. 15660
d. 30720

23. The value of the term independent of x in the expansion of $\left(2x^2 - \frac{1}{x}\right)^{12}$ is ----------

a. 7920
b. 1320
c. 5660
d. 2340

24. The one-to one & onto (injection & surjection) correspondence i.e. bijection mapping between two sets reveals the authentication of the ---------.

a. correctness and completeness of the transformation
b. correctness of the transformation
c. completeness of the transformation
d. correctness of the two sets

25. Two curves have joined at a common point. If at this common point, the consecutive nth order derivatives of the two curves are same (n being any positive integer), then n determines the degree of ---------- of the curves at common point.

a. correctness
b. completeness
c. derivability
d. smoothness.

26. In the information system, ... flows from a department/person to another department/person of the organization.

a. data
b. information
c. knowledge
d. files

27. A communication network that is itself a connection of many other networks is called .....

a.WWW
b. internet
c. telnet
d. Usenet

28. Which of the following is not the domain component of the internet address?

a. Transport organization
b. Educational institution
c. government organization
d. commercial organization

29. ..... Computing is a type of computing in which all data and information retrieval requests and responses pass over a network .

a. internet computing
b. client-server computing
c. surfing
d. browsing

30. one of the three principles of the information technology is analogous to the ..... .

a. Newton's third law
b. Newton's second law
c. Maxwell's law
d. Fourier transformation

31. The main difference between the data file and the database is that the database contains ..... data files.

a. functionally dependent
b. interrelated
c. independent
d. work flow dependent

32. The main difference between the project and ongoing business process is that the former is a ..... endeavour, but the product is not ..... (choose the same word at both blanks)

a. temporary
b. permanent
c. dynamic
d. static

33. The complexity of the algorithm is computed by approximating the upper and lower bounds of the lines of code involved in the realization of the task of the algorithm. These bounds can be determined through the.....

a. number input variables
b. number output variables
c. asymptotic analysis
d. count of the lines of code.

34. The difference between the third generation & fourth generation languages i. e. 3GLs & 4 GLs is that the program of the former contains the additional information about ..... to procure the result, which is avoided in the latter.

a. How ?
b. What ?
c. Where ?
d. When ?

35. The formation of a physical record i.e. a block needs a tradeoff between ----------

a. file size and LOC of program
b. logical record size and file size
c. secondary storage space and execution time
d. secondary storage space and buffer size

36. In C program, the use of user supplied header file in source file is incorporated through the preprocessor statement .....

a. # include ⟨filename of header file⟩
b. # include "filename of header file"
c. . # define ⟨filename of header file⟩
d. # define "filename of header file"

37. Consider the following program fragment

```
for (i = 1;  i < 5;  ++i)
if (i == 3) continue;
else printf ("%d ", i);
```

results in the print of

a. 1 2 4 5
b. 1 2 4
c. 2 4 5
d. None of the above

38. The following loop

```
while (printf ("%d", printf ("az")));
printf ("by");
```

a. Prints azbybybyby.....
b. Prints azbyazbyazbyazby....
c. Results in a syntax error
d. prints az2byaz2byaz2by.....

39. The minimum number of temporary variables needed to swap the contents of two variables is

a. 1
b. 2
c. 3
d. 0

40. The program fragment

```
main ()
 {
  int a = 5, b = 2;
  printf ("%d", a + + + b) ;
 }
```

will

a. results in syntax error
b. prints 7
c. prints 8
d. none of the above.

41. If integer needs two bytes of storage, then maximum value of a signed integer is .....

a. $2^{16} - 1$
b. $2^{15} - 1$
c. 2^{16}
d. 2^{15}

42. Consider the following fragment

```
procedure exchange (A: integer, B:integer)
    temp : integer;
begin
    temp := A; A := B; A := temp;
end;
 begin
   M := 2 ; X [M] := 4;
   exchange (M, X[M] ) ; write (M, X[2] );
 end.
```

If the output of this fragment is (4, 2), then the parameters are passed by .....

a. reference
b. name
c. value
d. none of the above

43. The following program

```
main ()
{ int abc ();
  abc ();
  (*abc) () ;
}
int abc ()
{  printf ("come") ;  }
```

a. results in a compiler error
b. prints come come
c. results in a run time
d. prints come come

44. Choose the correct statement.

a. All elements of the array should be of the same data type and storage class.
b. The number of subscripts determines the size of the array.
c. All elements of the array need not be of the same data type and storage class.
d. In an array definition, the subscript can be any expression yielding a non-zero integer value.

45. The default parameter passing mechanism is .....

a. call by value
b. call by reference
c. call by value result
d. none of the above.

46. The following program

```
main ()
{printf ("Shri") ;
main () ; }
```

a. is illegal
b. keeps on printing Shri
c. prints Shri once
d. none of the above.

47. Consider the declaration

int $a = 5,$ $*b = \&a;$

The statement

printf ("%d" , a ** b); prints

a. 25
b. garbage
c. 0
d. an error message

48. Void can be used

a. as a data-type of a function that returns nothing to its calling environment
b. to pass NULL value
c. in an expression
d. in a printf statement

49. The file open statement

a. reserves a logical record length of memory in the buffer
b. reserves a physical record length of memory in the buffer
c. reserves a logical record length of memory in the secondary storage
d. reserves a physical record length of memory in the secondary storage

50. The nibble contains _____bits

a. 8
b. 16
c. 4
d. 32

Part II (Two marks questions) 25 X 2 = 50 marks

51 If $f(t)$ is **piecewise regular and of exponential order**, then Laplace transform is defined as

$$\mathcal{L}\{f(t)\} = \int_0^{\infty} f(t)e^{-st}\ dt$$

In the predicate phrase the conditions pair mean

a. $\lim_{t\to\infty}(f(t)e^{-st}) = 0$
b. $\lim_{t\to\infty}(f(t)e^{-st}) = c,\ c \neq 0$
c. $\lim_{s\to\infty}(f(t)e^{-st}) = 0$
d. $\lim_{s\to\infty}(f(t)e^{-st}) = c,\ c \neq 0$

52. $\mathcal{L}^{-1}\left\{\frac{1}{s^2\ (s^2+w^2\ )}\right\} =$ ... ...

a. $[wt - sinwt]$
b. $\frac{1}{w}\left[wt - sinwt\right]$
c. $\frac{1}{w^2}\left[wt - sinwt\right]$
d. $\frac{1}{w^3}[wt - sinwt]$

53. . The shortest distance between the two lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$ is ---------

a. $\frac{1}{\sqrt{6}}$
b. $\frac{3}{\sqrt{6}}$
c. $\frac{5}{\sqrt{6}}$
d. $\frac{7}{\sqrt{6}}$

54. The sum of integers within the range 1 to 100 which are divisible by 2 or 5 is ----------

a. 550
b. 1050
c. 2550
d. 3050

55. The angle of intersection between the two cardioids $r = a(1 + cos\theta)$ and $r = b(1 - \cos\theta)$ is ------

a. $\frac{\pi}{6}$
b. $\frac{\pi}{4}$
c. $\frac{\pi}{3}$
d. $\frac{\pi}{2}$

56. An engineering student needs two of the three internal tests of internal assessment. The probability of his/her qualifying in the first test is p. If he/she fails in one of the tests, the probability of his/her qualifying the next test is $\frac{p}{2}$, otherwise it remains p. Find the probability of his/her qualifying the internal assessment.

a. $\frac{11p^2 - p^3}{4}$
b. p^2
c. $p^2 + \frac{p^3}{2}$
d. $2p^2 - p^3$

57. The value of the determinant $\begin{bmatrix} b^2 + ac & bc & c^2 \\ ab & 2ac & bc \\ a^2 & ab & b^2 + ac \end{bmatrix}$ is equal to ----------

a. -bac
b. 2abc
c. $(b^2 + ac)^2$
d. $4a^2b^2c^2$

58. Let A, B and C be sets with cardinalities respectively 40, 45, 35. The cardinalities of other intersection sets are as follows.

$A \cap B = 5, \quad A \cap C = 9, \quad B \cap C = 8, \quad (A \cap B) \cap (A \cap C) = 3.$

Using this data, the cardinality of $A \cap (B \cup C) is$ ------.

a. 29
b. 26
c. 18
d. 27

59. If $\alpha, \beta \text{ and } \gamma$ are the angles made by the line with respect to the axes X, Y and Z axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma =$ ------

a. -1
b. 1
c. 2
d. π

60. Identify from the following options, an abelian group.

a. Cube root of unity with respect to multiplication
b. Cube root of unity with respect to addition
c. Non-singular matrices of order 2 with respect to multiplication.
d. singular matrices of order 2 with respect to addition.

61. The unit step function used in conjunction with the curve $f(x)$ represents the--------.

a. Half part of the curve.
b. normal to the curve.
c. Complete curve
d. Tangent to the curve.

62. The unit impulse function $\delta(t - t_0)$ defined by

$$\delta(t - t_0) = \begin{cases} 0 & t \neq t_0 \\ \infty & t = t_0 \end{cases}$$ and $\int_{-\infty}^{\infty} \delta(t - t_0)\, dt = 0.$ This is used to transform

a. Realizable concentrated load into unrealizable distributed load
b. Unrealizable concentrated load into realizable distributed load
c. Realizable concentrated load into realizable distributed load
d. Unrealizable concentrated load into unrealizable distributed load

63. The greatest common divisor (gcd) between two numbers 99, 78 is .....

a. 2
b. 3
c. 15
d. 21

64. The series solution of the equation $y = \sin(e^x - 1)$ is $x =$ .....

a. $x = y - \frac{y^2}{2} + - \square \ldots\ldots\ldots$
b. $x = -y + \frac{y^2}{2} - + \cdots \ldots\ldots\ldots$
c. $x = y + \frac{y^2}{2} + + \cdots \ldots\ldots\ldots$
d. $x = -y - \frac{y^2}{2} - - \square \ldots\ldots\ldots$

65. One of the main differences between the matrix and determinant is that
a. Matrix represents an array of elements and determinant represents a single value.
b. Both represent single value each
c. Both represent array of elements each
d. Matrix represents a single value and determinant represents an array of elements

66. The computer differs from other physical devices as it obeys the instructions through the ..... and the other physical devices obey the instruction through the .....

a. language, physical application
b. keyboard, electromechanical application
c. program, online operations
d. operating system, sequence of operations

67. The programming languages are called higher level languages based on the understanding capability with respect to .....

a. Semiotics of the language
b. machine proximity
c. programmer proximity
d. ease of programming language.

68. The referenced attribute domain pairs of the entity in a program are realized in .....

a. buffer
b. secondary memory
c. Arithmetic logic unit
d. tabular form

69. The blocking of logical records into physical record reduces ..... From/of .....memory, but increases ..... costs.

a. number of accesses, secondary to primary, overhead
b. buffer size, primary, operation
c. file size, secondary, transfer
d. buffer size, primary, file maintenance.

70. The data flow diagram (DFD) is one of the ..... models of the structured system analysis and represents the ..... aspect of the information system.

a. three, structural
b. nine, structural
c. nine, behavioural
d. three, behavioural

71. All programming languages programs will become legacy as their development is .....

a. needbased & without naturalness
b. without strict syntax and semantics
c. with strict context specific meaning
d. relatively with naturalness

72. The preprocessor statement '# define name replacement-text' directs the preprocessor to

a. replace every occurrence of the token 'name' with 'replacement-text' in the source file
b. use the header file 'name' for each occurrence of 'replacement-text'
c. replace only the first occurrence of the token 'name' with replacement-text in the source file
d. replace every occurrence of the token 'replacement-text' by 'name' in the source file

73. Consider the following preprocessor statements.

```
# ifndef MYHEADER
# define MYHEADER
# endif
```

Here, the conditional directive ifndef MYHEADER evaluates ..... as true.

a. Unconditionally
b. Conditionally if MYHEADER has not been defined previously
c. Conditionally if MYHEADER has been defined previously
d. None of the above.

74. Consider the function swap() in the following figure.

```
# include <stdio.h> /* printf() is declared in <stdio.h> */
Void swap(int x, int y)
{
      Int temp;
      printf ("\n swap() , Before: x = %d, y = %d"  , x, y);
      temp = x;
      x = y;
      y = temp;
       printf ("\n swap() , After: x = %d, y = %d"  , x, y);
}
Main()
{
      Int a= 10, b = 20;
      printf ("\n main() , Before: x = %d, y = %d"  , x, y);
      swap(a,b);
      printf ("\n main() , After: x = %d, y = %d"  , x, y);
 }
```

The output of the implementation is

```
          main() , Before: a = 10, b = 20
           swap() , Before: x = 10, y = 20
```

and choose one of the following

a.
```
swap() , After: x = 20, y = 10
main() , After: a = 20, b = 10
```

b.
```
swap() , After: x = 20, y = 10
main() , After: a = 10, b = 20
```

c.
```
swap() , After: x = 10, y = 20
main() , After: a = 20, b = 10
```

d.
```
swap() , After: x = 10, y = 20
main() , After: a = 10, b = 20
```

75. A data driven machine is one that executes an instruction if the needed data is available. The physical ordering of the code listing does not dictate the course of execution. Consider the following pseudo-code.

1. Multiply E by 0.5 to get F
2. Add B with 0.5 to get D
3. Add A with 10.5 to get C
4. Add A and B to get E
5. Add E and F to get G.

Assume that A, B and C are already assigned values and the desired output is G. In how many different ways can the 5 instructions be sequenced?

a. 10
b. 8
c. 6
d. 12