2013 – CA QUESTION BOOKLET CODE **A**

Test Paper Code : CA

Time : 3 Hours **Maximum Marks : 100**

INSTRUCTIONS

A. General :

1. This Booklet is your Question Paper. It contains **20** pages and has 100 questions.
2. The Question Booklet **Code** is printed on the right-hand top corner of this page.
3. The Question Booklet contains blank spaces for your rough work. No additional sheets will be provided for rough work.
4. **Clip board, log tables, slide rule, cellular phone and electronic gadgets in any form are NOT allowed. Non Programmable Calculator is allowed.**
5. Write your **Name** and **Registration Number** in the space provided at the bottom.
6. All answers are to be marked only on the machine gradable Objective Response Sheet **(ORS)** provided along with this booklet, as per the instructions therein.
7. The Question Booklet along with the Objective Response Sheet **(ORS)** must be handed over to the Invigilator before leaving the examination hall.
8. Refer to **Special Instruction/Useful Data** on reverse of this sheet.

B. Filling-in the ORS :

9. Write your Registration Number in the boxes provided on the **ORS** and darken the appropriate bubble under each digit of your Registration Number using a **black ink ball point pen.**
10. Ensure that the **code** on the **Question Booklet** and the **code** on the **ORS** are the same. If the codes do not match, report to the Invigilator immediately.
11. On the **ORS**, write your Name, Registration Number, Name of the Test Centre and put your signature in the appropriate box with ball-point pen. Do not write these anywhere else.

C. Marking of Answers on the ORS :

12. Each question has **4 choices** for its answer : (A), (B), (C) and (D). Only **ONE** of them is the correct answer.
13. On the right-hand-side of **ORS**, for each question number, darken with a **black ink ball point pen** ONLY one bubble corresponding to what you consider to be the most appropriate answer, from among the four choices.
14. There will be **negative marking** for wrong answers.

MARKING SCHEME :

(a) For each correct answer, you will be awarded **1 (One)** mark.

(b) For each wrong answer, you will be awarded **–1/3 (Negative 1/3)** mark.

(c) Multiple answers to a question will be treated as a wrong answer.

(d) For each un-attempted question, you will be awarded **0 (Zero)** mark.

Name							
Registration Number							

A

Special Instructions/ Useful Data

R denotes the set of real numbers

$\ln x$ denotes $\log_e x$

f' denotes the first derivative of the function f

f'' denotes the second derivative of the function f

$f_x = \frac{\partial f}{\partial x}$ denotes the partial derivative of the function f with respect to x

∇f denotes the gradient of the function f

$P(X = n)$ denotes the probability of $X = n$

x' denotes the complement of the Boolean variable x

LPP denotes Linear Programming Problem

max f denotes the maximum of function f

min f denotes the minimum of function f

x^T denotes the transpose of vector x

For all C programs and segments assume that all the standard library functions are accessible

A

Q.1 If the function $f:\mathbf{R}\to[0,2]$ is defined by $f(x)=|\cos x|+|\sin x|$, then

(A) f is one-one (B) f is onto

(C) f is differentiable on $\mathbf{R}$ (D) the minimum value of f is 1

Q.2 If the function $f(x)=x^3+ax^2+6x-1$ has a critical point at $x=-2$, then $f(x)=0$ has

(A) all three negative real roots

(B) one negative and two positive real roots

(C) one positive and two negative real roots

(D) one real and two complex roots

Q.3 The function $f(x)=x\sin x+\cos x-x^2$ has

(A) exactly one zero (B) exactly two zeros

(C) exactly three zeros (D) no zero

Q.4 If $(2.001)\times(3.999)^2$ is approximated using first order Taylor polynomial of two variables, then the approximate value is

(A) 31.999 (B) 32.001 (C) 32.000 (D) 31.891

Q.5 If $f(x,y)=x^3\tan^{-1}\left(\frac{y}{x}\right)+\frac{x^4+y^4}{x-y}$, then the value of $x\frac{\partial f}{\partial x}+y\frac{\partial f}{\partial y}$ is

(A) f (B) $2f$ (C) $3f$ (D) $4f$

Q.6 If $f(x,y)=\begin{cases}\dfrac{x^3-y^3}{|x|+|y|} & \text{if } (x,y)\neq(0,0)\\ 0 & \text{if } (x,y)=(0,0)\end{cases}$

then

(A) $f_x(0,0)=0,\ f_y(0,0)=0$ (B) $f_x(0,0)=1,\ f_y(0,0)=1$

(C) $f_x(0,0)=1,\ f_y(0,0)=-1$ (D) $f_x(0,0)=1,\ f_y(0,0)=0$

Q.7 If f and g are two differentiable functions such that $f'(x)=g(x)$ and $g'(x)=-f(x)$ with $f(0)=0$ and $g(0)=1$, then $f^2(x)+g^2(x)$ is

(A) 4 (B) 1 (C) $f(x)+g(x)$ (D) $f(x)-g(x)$

Q.8 The area of the region bounded by the lines $|x|+|y|=1$ is

(A) 1 (B) 2 (C) 3 (D) 4

Q.9 If a function f defined for all positive real numbers is such that $f'(x^2) = x^5$ with $f(1) = 1$, then $f(x)$ is

(A) $\frac{3}{7}x^{7/2} + \frac{4}{7}$ (B) $\frac{2}{7}x^{7/2} + \frac{5}{7}$

(C) $\frac{4}{7}x^{7/2} + \frac{3}{7}$ (D) $\frac{1}{6}x^{7/2} + \frac{5}{6}$

Q.10 The general solution of the differential equation $\frac{d^3y}{dx^3} - \frac{d^2y}{dx^2} + \frac{dy}{dx} - y = 0$ is

(A) $y = c_1e^x + c_2\cos x + c_3\sin x$ (B) $y = c_1e^{-x} + c_2\sin x + c_3\cos x$

(C) $y = c_1e^x + c_2xe^x + c_3e^{-x}$ (D) $y = c_1e^{-x} + c_2\sin(x + c_3)$

Q.11 Consider the table

x	-1	0	1
$f(x)$	-2	-1	0

Using Lagrange interpolation the value of $f(0.6)$ is

(A) -0.32 (B) 0.4 (C) -0.4 (D) 0.32

Q.12 If the non-zero root of the equation $\sin x - x^2 = 0$ is approximated using the first two terms in the Taylor's series expansion of $\sin x$, then the approximate root is

(A) $-\left(\sqrt{15} + 3\right)$ (B) 1.0 (C) 0.8 (D) $\sqrt{15} - 3$

Q.13 Consider the iterative scheme $x_{n+1} = \frac{2}{3 - x_n}$ with $x_0 = 0$, then the value of x_4 is

(A) $\frac{2}{3}$ (B) $\frac{6}{7}$ (C) $\frac{62}{63}$ (D) $\frac{30}{31}$

Q.14 Consider the table

x	1	2	3	4
y	13	15	19	22

Then the value of $\Delta^3 y$, where Δ is the forward difference operator, is

(A) -3 (B) 3 (C) 2 (D) -2

Q.15 Let $[x]$ denote the largest integer less than or equal to x. The value of the integral $\int_0^{100} [x]\,dx$, computed by the composite trapezoidal rule with step size 1, is

(A) 4950 (B) 5000 (C) 9900 (D) 5050

Q.16 The integral $\int_{-1}^{1} f(x)\,dx$ is approximated by the formula $\int_{-1}^{1} f(x)dx \approx f(\alpha) + f(-\alpha),\ \alpha \in [0,1]$. If the approximation is exact for all polynomials of degree at most 3, then the value of α is

(A) $\frac{1}{\sqrt{3}}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{\sqrt{2}}$

Q.17 The surface area of the surface $x^2 + y^2 = 2 - z$, for $z \geq 0$, is

(A) $\frac{104\pi}{3}$ (B) $\frac{13\pi}{2}$ (C) $\frac{13\pi}{3}$ (D) 2π

Q.18 The area bounded by $y = x|x|$ and $y^2 = |x|$ is

(A) $\frac{2}{3}$ (B) $\frac{3}{2}$ (C) $\frac{1}{3}$ (D) 2

Q.19 The area of a loop of the curve $r = 4\cos^2\theta \sin\theta$ is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{8}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{4}$

Q.20 The integral $\int_{y=0}^{1} \int_{x=y^2}^{\sqrt{y}} f(x,y)\,dx\,dy$ is equivalent to

(A) $\int_{x=0}^{1} \int_{y=x^2}^{\sqrt{x}} f(x,y)\,dy\,dx$ (B) $\int_{x=0}^{1} \int_{y=0}^{1} f(x,y)\,dy\,dx$

(C) $\int_{x=0}^{4} \int_{y=x^2}^{\sqrt{x}} f(x,y)\,dy\,dx$ (D) $\int_{x=0}^{4} \int_{y=0}^{\sqrt{2}} f(x,y)\,dy\,dx$

Q.21 The volume of the region bounded by the surfaces $z = 4 - \sqrt{x^2 + y^2}$ and $z = \sqrt{x^2 + y^2}$ is

(A) $\frac{2\pi}{3}$ (B) $\frac{8\pi}{3}$ (C) $\frac{4\pi}{3}$ (D) $\frac{16\pi}{3}$

Q.22 Let $y(x)$ be a solution of $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = 9e^{-x}$ satisfying $\lim_{x \to \infty} y(x) = 0$. Then $y(0)$ is

(A) 0 (B) 1 (C) 2 (D) 7

Q.23 The general solution of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x$ is

(A) $c_1e^x + c_2xe^x + x^3e^x$ (B) $c_1e^x + c_2xe^x + x^2e^x$

(C) $c_1e^x + c_2xe^x + \frac{1}{2}x^3e^x$ (D) $c_1e^x + c_2xe^x + \frac{1}{2}x^2e^x$

Q.24 The integral $\int_{x=-1}^{1} \int_{y=1+x}^{1-x} \cos(x+y)e^{y-x}\,dy\,dx$ is equivalent to

(A) $\frac{1}{2}\int_{u=-1}^{1} \int_{v=-u}^{1} e^v \cos u\,dv\,du$ (B) $\frac{1}{2}\int_{u=-1}^{1} \int_{v=-1}^{1} e^v \cos u\,dv\,du$

(C) $\frac{1}{2}\int_{u=-1}^{1} \int_{v=u}^{1} e^v \cos u\,dv\,du$ (D) $\frac{1}{2}\int_{u=-1}^{1} \int_{v=\frac{u}{2}}^{1} e^v \cos u\,dv\,du$

Q.25 Consider the following C function

```
int fun(int n){
    int b=0;
    while(n!=0){
        b = b*10+n%10;
        n=n/10;}
    return b;}
```

The value of fun(7830) is

(A) 7830 (B) 783 (C) 387 (D) 1000

Q.26 What does the following C program segment display when executed?

```
int i;
long int k=0;
for(i=1;i<=50;i++)      k+=(i*i);
printf("%d",k);
```

(A) 42075 (B) 42925 (C) 42950 (D) 42750

Q.27 What does the following C program segment display when executed?

```
int arr[] = {1,5,7,8,9};
int k=0,i;
for(i=0;i<5;++i) k=k+*(arr+i);
printf("%d",k);
```

(A) 29 (B) 21 (C) 9 (D) 30

Q.28 Consider the following C program. What does it display when executed?

```
#include<stdio.h>
static int b=0;
int fun2(int);
int main(){
     int a;
     a=fun2(6);
     printf("(%d,%d)",a,b);
     return 0;}
int fun2(int n){
     if (n==1 || n==2) return 1;
     else{
          b+=2;
          return fun2(n-1) +fun2(n-2);}}
```

(A) (8,14) (B) (8,12) (C) (12,8) (D) (14,16)

Q.29 The output of the following C code segment is

```
int *p,*q, a=3, b=2;
p=&a;
q=&b;
p=q;
b=*q;
printf("%d %d %d %d",a,b,*p,*q);
```

(A) 3 2 3 2 (B) 2 2 2 2 (C) 3 3 3 3 (D) 3 2 2 2

Q.30 The value of the variable *k* after the execution of the following C code segment is

```
int i=0,j=0,k=0;
int m=10,n=20;
for(i=0;i<m;i++){
     j=i;
     while(j<=n){
          ++k;
          j++;}}
```

(A) 210 (B) 200 (C) 165 (D) 220

A

Q.31 The output of the following C program segment is

```
int a=1;
if(a=10&5) printf("Invalid operation!");
else printf("%d",a);
```

(A) Invalid operation! (B) 1
(C) 10 (D) 0

Q.32 Consider the following C function.

```
double fun(){
    double a=1.0;
    int i;
    long int k=1;
    for(i=1;i<=20;i++){
        k*=i;
        a+= 1.0/k;}
    return a;}
```

The value returned by `fun()` approximates
(A) $\sin(1.0)$ (B) $\cos(1.0)$ (C) π (D) e

Q.33 What does the following C function return for positive integers a and b?

```
int fun3(int a, int b){
    if(b==1) return a;
    else return fun3(a,b/2)*fun3(a,b/2+b%2); }
```

(A) b^a (B) a^b (C) ab (D) ab^a

Q.34 What does the following C program segment display?

```
int m=1,n=2,p=3,q=4;
printf("%d",m<=n<p*q==12!=n+n);
```

(A) 0 (B) 1 (C) 2 (D) 4

Q.35 In IPv4, the length of an IP address is
(A) 16 bits (B) 32 bits (C) 48 bits (D) 64 bits

Q.36 2's complement representation of $(-17)_{10}$ is
(A) 111111 (B) 101110 (C) 101111 (D) 110001

Q.37 Consider the following two lists

List I		List II	
1:	Hub	*P:*	Input Device
2:	Joystick	*Q:*	Memory
3:	Modem	*R:*	Visual Display Unit
4:	Mouse	*S:*	Network Device

The correct match is

(A) $1 \to S, 2 \to P, 3 \to S, 4 \to P$ (B) $1 \to Q, 2 \to P, 3 \to S, 4 \to P$

(C) $1 \to S, 2 \to P, 3 \to Q, 4 \to Q$ (D) $1 \to R, 2 \to P, 3 \to S, 4 \to P$

Q.38 There is a $2^m \times n$ memory module, where cells are organized into 2^m words of n bits each. Which of the following is true?

(A) There are 2^m address lines and 2^n output lines

(B) There are m address lines and 2^n output lines

(C) There are 2^m address lines and n output lines

(D) There are m address lines and n output lines

Q.39 In 'https', the letter 's' stands for

(A) standard (B) secure (C) simple (D) smart

Q.40 Consider the following two lists

List I		List II	
1:	Java	*P:*	Text Editor
2:	Notepad	*Q:*	Object Oriented Programming Language
3:	Norton	*R:*	Operating System
4:	Android	*S:*	Anti Virus Software

The correct match is

(A) $1 \to R, 2 \to P, 3 \to P, 4 \to R$ (B) $1 \to Q, 2 \to P, 3 \to S, 4 \to R$

(C) $1 \to Q, 2 \to P, 3 \to R, 4 \to Q$ (D) $1 \to R, 2 \to P, 3 \to S, 4 \to Q$

Q.41 A **SIM** in a mobile phone stands for

(A) Subscriber Internet Module (B) Subscriber Identity Module

(C) Subscriber Internet Model (D) System Internet Module

Q.42 The binary equivalent of $(3F8A)_{16}$ is

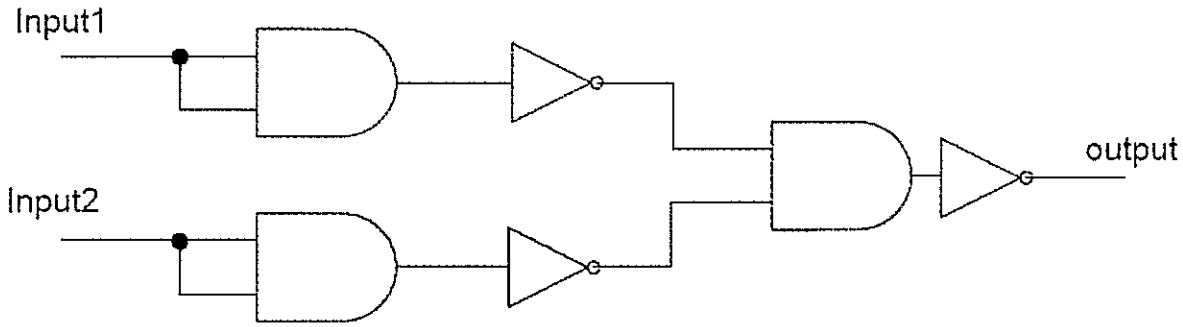
(A) 1001111110101011 (B) 0011101110001010

(C) 0101111110011010 (D) 0011111110001010

Q.43 In general, for a computer which of the following represents the memories in increasing order of their capacities

(A) Register < RAM < Cache < Hard Disk
(B) RAM < Cache < Hard Disk < Register
(C) Register < Cache < RAM < Hard Disk
(D) Cache < RAM < Hard Disk < Register

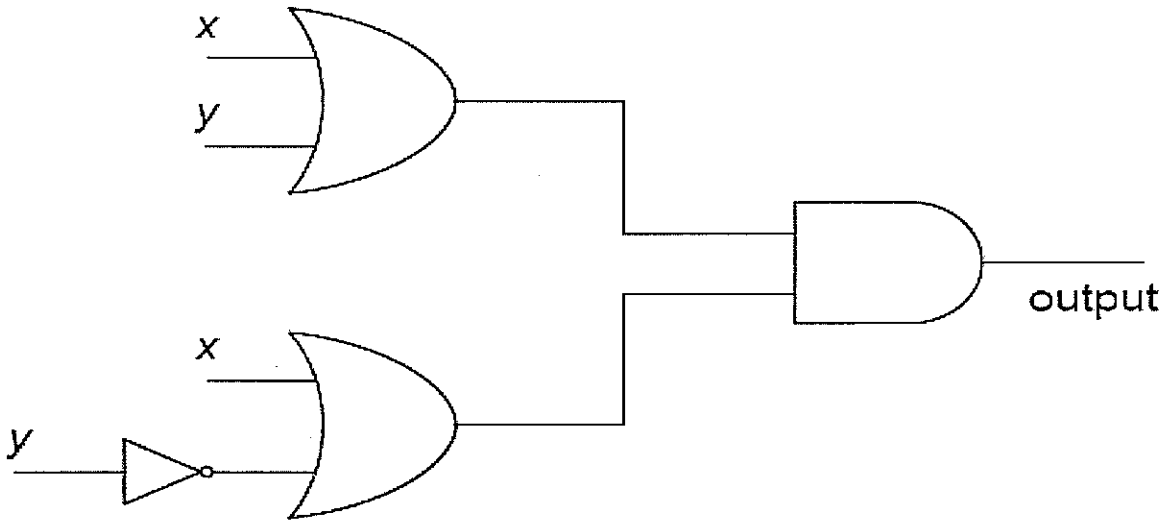
Q.44 The circuit given below



is equivalent to 2-input

(A) NAND gate
(B) AND gate
(C) NOR gate
(D) OR gate

Q.45 The output of the circuit given below is



(A) 0
(B) y
(C) $x \cdot y$
(D) x

Q.46 The truth table of a Boolean function $f(x,y,z)$ is given below

x	y	z	$f(x,y,z)$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

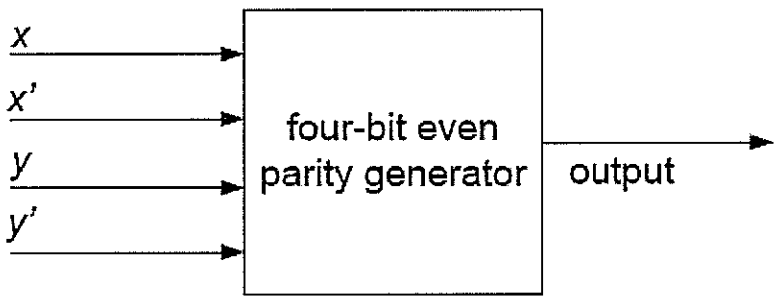
Then $f(x,y,z)$ is equal to

(A) $x \cdot y$ (B) x (C) y (D) $x + y$

Q.47 Let the Boolean function $f(i_1, i_2, ..., i_{10}) = i_1 \cdot i_2 \cdot ... \cdot i_{10}$ be realized using two input AND gates only. Then the minimum number of two input AND gates required is

(A) 5 (B) 10 (C) 8 (D) 9

Q.48 The output of the following four-bit even parity generator is



(A) $x+y$ (B) 1 (C) 0 (D) $x' + y'$

Q.49 Suppose two fair dice are rolled. The probability of obtaining a sum of 6 or 7 is

(A) $\frac{5}{36}$ (B) $\frac{11}{36}$ (C) $\frac{5}{6}$ (D) $\frac{35}{36}$

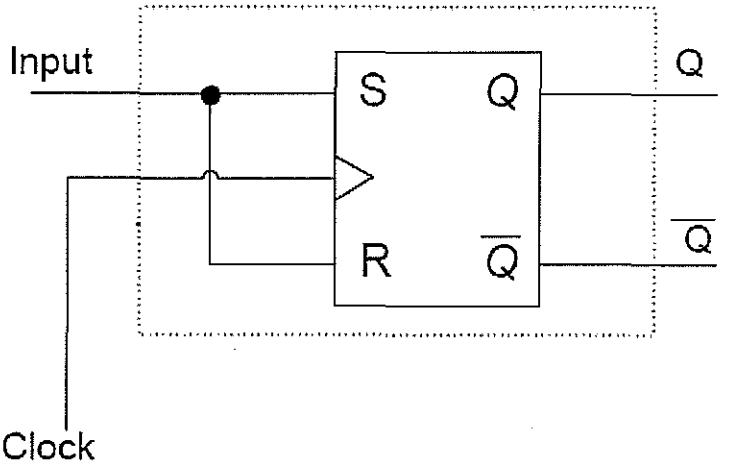
Q.50 Let X be a random variable following Poisson distribution. If $P(X = 0) = 0.4$, then $P(X \geq 2)$ is equal to

(A) $-0.4 \ln 0.4$ (B) $0.6 - 0.4 \ln 0.4$

(C) 0.6 (D) $0.6 + 0.4 \ln 0.4$

A

Q.51 It is claimed that the circuit in the dotted box given below converts an S-R flip-flop to another type of flip-flop.



Which of the following is true ?

(A) S-R flip-flop is converted to T flip-flop

(B) S-R flip-flop is converted to D flip-flop

(C) Claim is false because S=1 and R=1 is not allowed in S-R flip-flop

(D) Claim is false because S=0 and R=0 is not allowed in S-R flip-flop

Q.52 Suppose two fair dice are rolled. The probability that one face is 4 given that the faces show different numbers is

(A) $\frac{5}{6}$ (B) $\frac{1}{2}$ (C) $\frac{1}{3}$ (D) $\frac{1}{6}$

Q.53 A box contains ten screws out of which four are defective. Six screws are drawn one by one at random, without replacement. The probability that the sixth screw drawn is the last defective one, is

(A) $\frac{32}{729}$ (B) $\frac{5}{21}$ (C) $\frac{1}{21}$ (D) $\frac{2}{729}$

Q.54 Suppose $\vec{a} = 2\hat{i} + \hat{j} + 4\hat{k}$, $\vec{b} = -4\hat{i} + 3\hat{k}$, $\vec{c} = 3\hat{i} - 2\hat{j}$. The value of $\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a}$ is

(A) 2 (B) -2 (C) -4 (D) 4

Q.55 The volume of the parallelepiped obtained by three edge vectors $\hat{i} + 2\hat{j} + \hat{k}$, $-\hat{i} + \hat{j}$, and $\hat{j} - \hat{k}$ is

(A) 8 (B) 2 (C) 1 (D) 4

A

Q.56 The equation of the plane passing through $P(0,0,1)$, $Q(1,1,0)$ and $R(0,2,0)$ is

(A) $2x+y+z=1$ (B) $x+y+2z=1$

(C) $x+2y+z=1$ (D) $x+y+2z=2$

Q.57 If the vectors $2\hat{i}+\alpha\hat{j}+4\hat{k}$, $8\hat{j}+\beta\hat{k}$, and $-20\hat{i}-4\hat{j}+8\hat{k}$ are mutually orthogonal, then (α,β) is

(A) (2,–4) (B) (2,4) (C) (–2,–4) (D) (–2,4)

Q.58 The area of the triangle with vertices $P(0,0,1)$, $Q(1,2,3)$ and $R(0,4,1)$ is

(A) $2\sqrt{5}$ (B) $4\sqrt{5}$ (C) $\sqrt{5}$ (D) $8\sqrt{5}$

Q.59 The number of Boolean functions $f(x,y)$ satisfying $f(x,y)=f(x',y')$ is

(A) 2 (B) 4 (C) 8 (D) 16

Q.60 Four terabytes is equal to

(A) 2^{42} bytes (B) 2^{25} bytes (C) 2^{40} bytes (D) 2^{43} bytes

Q.61 The Boolean expression $(x+y+z)\cdot(x'+y+z)\cdot(x+y'+z)\cdot(x+y+z')$ is equivalent to

(A) $(x+y)\cdot(x+z)\cdot(y+z)$

(B) $(x'+y')\cdot(x'+z')\cdot(y'+z')$

(C) $(x+y')\cdot(x+z')\cdot(y+z')$

(D) $(x'+y)\cdot(x'+z)\cdot(y'+z)$

Q.62 Let $S=\{1,2,3,4,5,6,7,8,9,10\}$. The number of subsets of S each having exactly one odd integer is

(A) $6\cdot2^6$ (B) 2^{10} (C) 2^9 (D) $5\cdot2^5$

Q.63 In a class, each student takes at least one and at most two electives out of three electives namely, DMS, DS and ADA. The table below gives enrollment information of the students in the above courses:

Course	Number of students
DMS	90
DS	70
ADA	90
DMS and DS	30
DS and ADA	30
ADA and DMS	40

Then the total number of students in the class is

(A) 160 (B) 150 (C) 90 (D) 250

Q.64 The set $S = \left\{ \begin{pmatrix} a & -b \\ b & a \end{pmatrix} \middle| a, b \in \mathbf{R} \right\}$ is

(A) an abelian group under matrix multiplication
(B) a non-abelian group under matrix multiplication
(C) an abelian group under matrix addition
(D) a non-abelian group under matrix addition

Q.65 Let G be the group of all 2×2 real matrices $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ with $ad - bc \neq 0$, under matrix multiplication. Let $H_1 = \left\{ \begin{pmatrix} 1 & b \\ 0 & 2 \end{pmatrix} \middle| b \in \mathbf{R} \right\}$ and $H_2 = \left\{ \begin{pmatrix} 1 & c \\ 0 & 1 \end{pmatrix} \middle| c \in \mathbf{R} \right\}$. Then

(A) H_1 is a subgroup of G but H_2 is not a subgroup of G
(B) H_1 is not a subgroup of G but H_2 is a subgroup of G
(C) neither H_1 nor H_2 is a subgroup of G
(D) both H_1 and H_2 are subgroups of G

Q.66 The LPP

$$\min \ 4x + 5y$$

subject to

$$x + y \geq 10, \quad 2x + 5y \leq 30, \quad x \geq 0, \quad y \geq 0$$

(A) has no optimal solution (B) has more than one optimal solution
(C) has exactly one optimal solution (D) has no feasible solution

Q.67 Let α and β be two positive real numbers. If the number of optimal solutions of the LPP

$$\max \ \alpha x + \beta y$$

subject to

$$2x + 3y \geq 5, \quad x + y \leq 10, \quad x \geq 0, \quad y \geq 0$$

is infinite, then which of the following is possible?

(A) $\alpha = 2, \beta = 3$ (B) $\alpha = 3, \beta = 2$

(C) $\alpha = 2, \beta = 2$ (D) $\alpha = 1, \beta = 4$

Q.68 The number of feasible solutions of the LPP

$$\min \ x + y$$

subject to

$$2x + 3y \geq 3, \quad x + y \leq 1, \quad x \geq 0, \quad y \geq 0$$

is

(A) infinite (B) 0 (C) 1 (D) 4

Q.69 The number of extreme points of the set of feasible solutions of the LPP

$$\min \ x + 5y$$

subject to

$$x + y \geq 1, \quad 3x + 5y \leq 30, \quad x \leq 8, \quad y \geq 0$$

is

(A) 3 (B) 4 (C) 5 (D) 6

Q.70 Which of the following set of vectors in $\mathbf{R}^3$ forms a linearly independent set?

(A) $\{(1,1,0),(0,1,1),(1,0,1)\}$ (B) $\{(1,2,3),(1,2,0),(0,0,2)\}$

(C) $\{(1,1,1),(1,1,0),(0,0,1)\}$ (D) $\{(0,0,0),(0,0,1),(0,1,0)\}$

Q.71 Which of the following is a subspace of $\mathbf{R}^3$?

(A) $\{(x_1, x_2, x_3) \in \mathbf{R}^3 \mid 5x_1 - 3x_2 + 2x_3 = 0\}$

(B) $\{(x_1, x_2, x_3) \in \mathbf{R}^3 \mid 5x_1 - 3x_2 + 2x_3 = 1\}$

(C) $\{(x_1, x_2, x_3) \in \mathbf{R}^3 \mid x_1 + x_2 = 1, x_3 = 0\}$

(D) $\{(x_1, x_2, x_3) \in \mathbf{R}^3 \mid x_3 = 1\}$

A

Q.72 The inverse of $\begin{pmatrix} 0 & 1 & -1 \\ -1 & 0 & -1 \\ 1 & 0 & 0 \end{pmatrix}$ is

(A) $\begin{pmatrix} 0 & 1 & -1 \\ -1 & 0 & -1 \\ 1 & 0 & 0 \end{pmatrix}$ (B) $\begin{pmatrix} 1 & 0 & 1 \\ 1 & -1 & -1 \\ 0 & -1 & -1 \end{pmatrix}$

(C) $\begin{pmatrix} 0 & 0 & 1 \\ 1 & -1 & -1 \\ 0 & -1 & -1 \end{pmatrix}$ (D) $\begin{pmatrix} 0 & -1 & 1 \\ 1 & 0 & 1 \\ -1 & 0 & 0 \end{pmatrix}$

Q.73 If X is a random variable following binomial distribution with mean 1 and variance 0.8, then $P(X \geq 5)$ is

(A) $(0.2)^5$ (B) $1-(0.2)^5$ (C) $1-(0.8)^5$ (D) $(0.8)^5$

Q.74 License plates have 5 symbols consisting of 2 English letters followed by 3 decimal digits (0 to 9). The probability that in a randomly selected license plate all three digits are same, is

(A) $\frac{1}{10}$ (B) $\frac{1}{81}$ (C) $\frac{1}{100}$ (D) $\frac{1}{111}$

Q.75 Three letter words are framed using the letters a,e,i,o,u with repetitions. The probability that a randomly selected word contains all distinct letters is

(A) $\frac{16}{25}$ (B) $\frac{12}{25}$ (C) $\frac{24}{25}$ (D) $\frac{2}{25}$

Q.76 Let $\vec{P}$, $\vec{Q}$ and $\vec{R}$ be any three vectors. Then $(\vec{P}\times\vec{Q})\cdot\vec{R}$ is equal to

(A) $(\vec{Q}\times\vec{R})\cdot\vec{P}$ (B) $(\vec{R}\times\vec{Q})\cdot\vec{P}$ (C) $(\vec{P}\times\vec{R})\cdot\vec{Q}$ (D) $(\vec{Q}\times\vec{P})\cdot\vec{R}$

Q.77 The value of $\int_1^2 \frac{dx}{(x+1)\sqrt{x^2-1}}$ is

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$ (C) $\frac{2}{\sqrt{3}}$ (D) $2\sqrt{3}$

A

Q.78 An integrating factor for the differential equation $2xy + e^x - \frac{e^x}{y}\frac{dy}{dx} = 0$, is

(A) $\frac{1}{y}$ (B) $\ln y$ (C) e^y (D) e^{y^2}

Q.79 Given $y = x$ is a solution of $(x-1)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 0$. The other linearly independent solution of the differential equation is

(A) e^x (B) e^{-x} (C) xe^x (D) x^2e^x

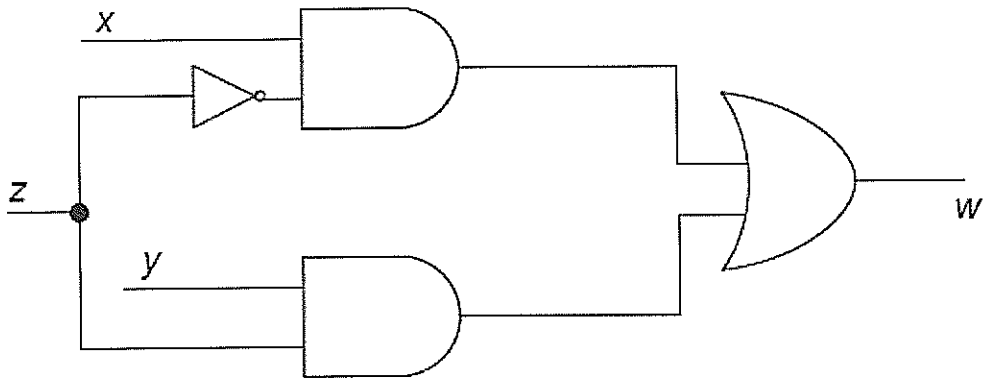
Q.80 The number of solutions of $\frac{dy}{dx} + |y| = 0, \quad y(0) = 1$, is

(A) 0 (B) 1 (C) 2 (D) more than 2

Q.81 The number of bits required to represent $(11)_{10}$ in Binary Coded Decimal (BCD) is

(A) 4 (B) 5 (C) 8 (D) 6

Q.82 The output w of the circuit given below is



(A) $(x+y)\cdot z$ (B) $(x+y)\cdot z'$ (C) $x\cdot z'+y\cdot z$ (D) $(x'+y')\cdot z$

Q.83 If A and B are $n \times n$ matrices such that $AB = B$ and $BA = A$, then $A^4 + B^4 - A^2 - B^2 + I$ equals

(A) $2A$ (B) $2B$ (C) $A+B$ (D) I

Q.84 If A is a 6×6 real symmetric matrix of rank 5, then the rank of $A^2 + A + I$ is

(A) 6 (B) 5 (C) 1 (D) 0

Q.85 If $A = (a_{ij})$ is a 4×4 matrix such that $a_{ij} = 2^{i+j}$, $1 \le i, j \le 4$, then determinant of A is

(A) 2^8 (B) 2^4 (C) 2 (D) 0

Q.86 If A is a square matrix such that $x^T Ax > 0$ for all nonzero $n \times 1$ column vectors x, then the system $Ax = 0$ has

(A) exactly one solution
(B) infinitely many solution
(C) a nonzero solution
(D) no solution

Q.87 The first Indian to win the Academy Award (Oscar) is

(A) A.R. Rahman
(B) Satyajit Ray
(C) Aamir Khan
(D) Bhanu Athaiya

Q.88 The Bharat Ratna in the year 2008 was awarded to

(A) Lata Mangeshkar
(B) Bhimsen Joshi
(C) Bismillah Khan
(D) Amartya Sen

Q.89 The Man of the Series in ICC Cricket World Cup 2011 was

(A) M.S. Dhoni
(B) Yuvraj Singh
(C) Sachin Tendulkar
(D) Gautam Gambhir

Q.90 The painting "Mona Lisa" is housed in

(A) da Vinci Art Gallery
(B) Louvre Museum
(C) Albert Museum
(D) Metropolitan Museum of Art

Q.91 Who among the following was one of the Nine Gems (Navaratnas) in the court of Chandragupta II ?

(A) Tansen
(B) Kalidasa
(C) Valmiki
(D) Aryabhatta

Q.92 Which one of the following is the oldest Indian Institute of Technology ?

(A) Indian Institute of Technology Delhi
(B) Indian Institute of Technology Kanpur
(C) Indian Institute of Technology Bombay
(D) Indian Institute of Technology Kharagpur

Q.93 The Government of India has declared the year 2012 as the national year of

(A) Chemistry (B) Physics (C) Mathematics (D) Medicine

Q.94 The next element in the sequence $1, -3, 7, -15, \ldots$ is

(A) -27 (B) 27 (C) 31 (D) -31

Q.95 Consider the following two lists

List I		List II	
1:	Apple Inc.	*P:*	N.R. Narayana Murthy
2:	Microsoft Corp.	*Q:*	Steve Jobs
3:	Infosys Ltd.	*R:*	Bill Gates
4:	Airtel	*S:*	Sunil Bharti Mittal

The correct match is

(A) $1 \to Q, 2 \to R, 3 \to P, 4 \to S$ (B) $1 \to S, 2 \to R, 3 \to P, 4 \to Q$

(C) $1 \to S, 2 \to P, 3 \to R, 4 \to Q$ (D) $1 \to Q, 2 \to P, 3 \to R, 4 \to S$

Q.96 Suppose a country has coins of denominations 1, 4, and 5. The minimum number of coins required to make the amount 13 is

(A) 2 (B) 3 (C) 4 (D) 5

Q.97 Let F be a field of prime order p. Let $G = \{q(x) \mid q(x)$ is a polynomial of degree at most n over $F\}$. Then G is a field of order

(A) n^p (B) p^n (C) p^{n+1} (D) $(n+1)^p$

Q.98 The number of linearly independent eigenvectors of $A = \begin{pmatrix} 5 & 0 & 5 & 2 \\ 0 & 4 & 2 & 1 \\ 0 & 0 & 3 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix}$ is

(A) 4 (B) 3 (C) 2 (D) 1

Q.99 The minimum value taken by the function $f(x) = \dfrac{|x|}{1+|x|} - 1$ is

(A) 0 (B) -1 (C) 1 (D) 2

Q.100 The values of k for which the following system of linear equations has non-zero solutions

$x + y + z = 0, \quad 2x + ky + 3z = 0, \quad 3x + 5y + kz = 0$

are

(A) 1 and 4 (B) 2 and 4 (C) 3 and 5 (D) 2 and 5

A

Space for rough work

A

Space for rough work

A

Space for rough work