B-9

Booklet Code B

Entrance Examination (2013)

Master of Computer Applications (MCA)

Time: 2 Hours

Max. Marks: 100

Hall Ticket Number:

INSTRUCTIONS

1. (a) Write your Hall Ticket Number in the above box AND on the OMR Sheet.
   (b) Fill in the OMR sheet, the **Booklet Code** given above at the top left corner of this sheet. Candidates should also read and follow the other instructions given in the OMR sheet.
2. All answers should be marked clearly in the OMR answer sheet only.
3. This objective type test has two parts: Part A with 25 questions and Part B with 50 questions. Please make sure that all the questions are clearly printed in your paper.
4. Every correct answer in **Part A** carries **2 (two) marks** and for every wrong answer **0.66 mark will be deducted.**
5. Every correct answer in **Part B** carries **1 (one) mark** and for every wrong answer **0.33 mark will be deducted.**
6. Do not use any other paper, envelope etc for writing or doing rough work. All the rough work should be done in your question paper or on the sheets provided with the question paper at the end.
7. During the examination, anyone found indulging in copying or have any discussions will be asked to leave the examination hall.
8. Use of non-programmable calculator and log-tables is allowed.
9. Use of mobile phone is NOT allowed inside the hall.
10. Hand over the OMR answer sheet at the end of the examination to the Invigilator.
11. Candidate should Write and darken the correct Booklet Code of the question paper in the OMR Answer Sheet, without which such OMR answer sheets cannot be evaluated. The defaulting candidates in marking the Booklet Code in the OMR sheet shall not have any claim on their examination and the University shall not be held responsible for the lapse on the part of the candidate/s.

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Part A

1. It takes 6 technicians a total of 10 hours to install a new equipment from scratch, with each working at the same rate. If six technicians start to install the same equipment at 11:00 am, and one technician per hour is added beginning at 5:00 pm, at what time will the equipment installation be complete?

   A. 6:40 pm

   B. 7:00 pm

   C. 7:20 pm

   D. 8:00 pm

2. In how many ways is it possible to choose a white square and a black square on a chess board so that the squares must not lie in the same row or column?

   A. 56

   B. 896

   C. 60

   D. 768

3. Gopal's Shop sells small cookies in boxes of different sizes. The cookies are priced at Rs.2 per cookie up to 200 cookies. For every additional 20 cookies, the price of the whole lot goes down by 10 paise per cookie. What should be the maximum size of the box (in terms of number of cookies it can hold) that would maximize the revenue?

   A. 240

   B. 300

   C. 400

   D. None of these

4. 3 small pumps and a large pump are filling a tank. Each of the three small pumps works at $\frac{2}{3}$rd the rate of the large pump. In what fraction of the time that all 4 pumps working together will fill the tank in comparison to the time taken by the large pump alone?

   A. $\frac{4}{7}$

   B. $\frac{1}{3}$

   C. $\frac{2}{3}$

   D. $\frac{3}{4}$

5. Four cows are tethered at four corners of a square plot of side 14 meters so that the adjacent cows can just reach one another. There is a small circular pond of area 20 m^2 at the centre. The area left ungrazed is:

   A. 22 m^2

   B. 42 m^2

   C. 84 m^2

   D. 168 m^2

Answer questions 6 and 7 using the following information: 8 trees, viz. mango, guava, papaya, pomegranate, lemon, banana, raspberry and apple are planted in two rows, of four each aligned East-West. Lemon is between mango and apple but just opposite to guava. Banana is either at the end of a row and is just immediately to the right of guava, or Banana is just next to Guava. Raspberry is at the end of a row, and mango is at the other end of the opposite row.

6. Which of the following is always true

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A. Apple is just next to Lemon

B. Papaya is just next to Apple

C. Raspberry is either to the left or to the right of Pomegranate

D. Pomegranate is diagonally opposite to Banana

7. Which of these is directly opposite Banana?

A. Pomegranate

B. Mango

C. Papaya

D. None of these

8. How many number of times will the digit 7' be written when listing the integers from 1 to 1000?

A. 300

B. 271

C. 252

D. 304

9. There are 10 positive real numbers $n_1 < n_2 < n_3 \ldots < n_{10}$. How many triplets of these numbers $(n_1, n_2, n_3), (n_2, n_3, n_4), \ldots$ can be generated such that in each triplet the first number is always less than the second number; and the second number is always less than the third number?

A. 45

B. 90

C. 120

D. 180

10. There were two women amongst other men who took part in a chess tournament. Every participant played two games with every other participant. The number of games which only men played was exactly 104 games more than those played which involved a women. The total number of participants is

A. 13

B. 11

C. 14

D. 15

Answer questions 11 and 12 using the following information: In the English alphabet there are 11 symmetric letters that appear the same when looked at in a mirror. Other 15 letters in the alphabet are asymmetric letters.

11. How many four-letter computer passwords can be formed using only the symmetric letters (no repetition allowed)?

A. 7920

B. 330

C. 14640

D. 419430

12. How many three-letter computer passwords (no repetition allowed) can be formed with at least one symmetric letter?

A. 990

B. 2730

C. 12870

D. 15600

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13. Which letter in the word RUTHLESS has a position from the beginning of the word that is half as much as its position when seen in the alphabet ?

A. E

B. L

C. H

D. U

14. A wire of some length is bent in circular form and has an area of 308 sq. cm. If the same length of wire is straightened out and bent in the form of a square, the approximate area of the square in sq. cm may be

A. 121

B. 242

C. 308

D. 69.29

15. Consider a square circumscribed by a circle with a radius of 4 units. The area of the square in square units is

A. 16π

B. $16\sqrt{2}$

C. 32

D. 64

16. A man returns after shooting and catching birds in his bag. He was asked how many birds he had in his bag. He said, "They are all house sparrows but six, they are all pigeons but six, and all doves but six." The number of birds he had in all were ?

A. 36

B. 18

C. 9

D. 27

17. Suppose an ant is placed on one corner of a sugar cube, which has equal sides of 1.5 cm each. If the ant may walk only along the edges of the cube, what is the maximum distance the ant may walk on the cube without retracing its path ?

A. 18 cm

B. 9 cm

C. 10.5 cm

D. 13.5 cm

18. When the big hand of the clock is exactly at the 12 o' clock position, an ant starts to crawl in a counter clockwise direction from the 6 o' clock position at a constant speed. On reaching the big hand of the clock, the ant turns around and at the same speed, starts to crawl, in the opposite direction. Exactly 45 minutes after the first meeting with the big hand the ant crosses the big hand for the second time and dies. How long has the ant been crawling ?

A. 54 min.

B. 51 min.

C. 1 hr, and 9 min.

D. 1 hr, and 21 min.

19. One third of Shrihari's marks in Math equal half of his English marks. Shrihari noticed that in these two subjects his marks totaled 150. What did Shrihari score in English ?

A. 15

B. 60

C. 30

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D. 90

20. The sum of two digits of a number is 15. If 9 is added to the number then the digits get reversed. Which of the following is FALSE about the number

A. The number is divisible by 3

B. The number has the two digits separated by a difference of one

C. The number is divisible by 6

D. The number is divisible by 9

21. An ant is at a point P in a planar square field. It was observed that P is 13 feet from the corner A, and 17 feet from corner B (diagonal to A), and finally 20 feet from a third corner. The area in square feet of the field is

A. 231

B. 89

C. 369

D. 169

22. Consider the triangle ABC with sides AB=20 cm., AC=11 cm., and BC=13 cm. Then the length in cm. of the diameter of the semi-circle inscribed within ABC, which lies on AB, and has sides AC and BC as tangents is given by

A. 9

B. 11

C. 10

D. 10.5

23. On a straight road XY, 100 meters long, five heavy stones are placed 2 meters apart beginning at the end X. A worker, starting at X, has to transport all the stones to Y, by carrying only one stone at a time. The minimum distance he has to travel (in meters) is:

A. 422

B. 480

C. 744

D. 860

24. Given that $a^b c^a = abca$, where all a, b, c are integers, then which of the following is true

A. c=9

B. a=1

C. b=4

D. None of these

25. Instead of walking along two adjacent sides of a rectangular field, a boy took a short cut along the diagonal and saved a distance equal to half the longer side. Then the ratio of the shorter side to the longer side is:

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{4}$

D. $\frac{3}{4}$

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Part B

Answer the questions 26-27 based on the algorithm given below:

```
STEP 0: START
STEP 1: N := 0, C := 0, FLAG := FALSE
STEP 2: INPUT TABLE A[1..10]
STEP 3: FOR I = 1 TO 10 DO
              IF (A[I] = 1] THEN
                  N := N + 1
                  IF (FLAG = FALSE) THEN
                      C := I
                      FLAG := TRUE
                  ENDIF
              ENDIF
          ENDFOR
STEP 4: OUTPUT N, C
STEP 5: END
```

Given that A[1..10] = 7, 0, 0, 1, 1, 0, 3, 1, 9, 10

26. What are the values of N and C?

A. N = 3, C = 4

B. N = 4, C = 10

C. N = 4, C = 4

D. N = 3, C = 10

27. What are the values of N and C if the statement "FLAG := TRUE" is removed from the algorithm?

A. N = 4, C = 8

B. N = 4, C = 10

C. N = 3, C = 8

D. N = 3, C = 10

28. The n^{th} element of a series is represented as $X_n = (-1)^n X_{n-1}$. If $X_0 = x$ and $x > 0$, then which of the following is always true:

A. X_n is positive if n is even

B. X_n is positive if n is odd

C. X_n is negative if n is even

D. None of these

29. Given that n is an integer, which of the following is TRUE about the sum $S = 2^n + 3^n$

A. S is never the square of a rational number

B. S is always the square of a rational number

C. S is the square of a rational number, provided n is even

D. S is the square of a rational number, provided n is odd

30. If $f(x) = log(\frac{1+x}{1-x})$, then $f(x) + f(y)$ is:

A. $f\left(\frac{x+y}{1+xy}\right)$

B. $f(x+y)$

C. $(x+y)f\left(\frac{1}{1+xy}\right)$

D. $\frac{f(x)+f(y)}{1+xy}$

31. In an equilateral triangle, let h, be the height and r be the radius of the circumcircle. Then the ratio $r : h$ is

A. $\sqrt{3}$:1

B. 2:3

C. $2\pi : \sqrt{3}$

D. $\pi : \sqrt{5}/2$

32. Let ϕ denote an empty set. The power set of the empty set is

A. ϕ

B. $\{\phi\}$

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C. $\{\phi, \{\phi\}\}$

D. None of these

33. Let A and B be two non-empty sets with cardinality p and q respectively. Then the total number of relations that can be defined from the set A to set B is

A. 2^q

B. 2^p

C. 2^{pq}

D. p, or q, or pv

34. Consider the relation f defined by $f(x) = \begin{cases} x^2 & 0 \leq x \leq 3 \\ 3x & 3 \leq x \leq 10 \end{cases}$ and the relation g defined by $g(x) = \begin{cases} x^2 & 0 \leq x \leq 2 \\ 3x & 2 \leq x \leq 10 \end{cases}$ then

A. f is a function but g is not

B. both f and g are functions

C. f is not a function but g is

D. neither of them are functions

35. Let f be subset of $\mathcal{Z} \times \mathcal{Z}$, where $\mathcal{Z}$ denotes the set of integers, and we have $f = \{(ab, a+b) : a, b \in \mathcal{Z}\}$. Then f is

A. bijective function

B. injective function

C. surjective

D. none of these

36. For real numbers x, y, and $n \in \mathcal{Z}$, $\sin x = \sin y$ implies which of the following ?

A. $x = n\pi + y$

B. $x = n\pi + (-1)^n y$

C. $x = 2n\pi \pm y$

D. $x = n\pi \pm y$

37. Show the bits in a 12 bit-register that is holding the number equivalent to decimal 215 in (i) binary coded octal and (ii) binary coded decimal

A. 000011000011,001000010101

B. 000011010111, 001000010101

C. 000011000111,001000010111

D. none of the above

38. If $(24)^2 = 587$ the base of the number system is

A. 14

B. 11

C. 9

D. 12

39. At how many points in the xy plane do the graphs of $y = x^{12}$ and $y = 2^x$ intersect?

A. One

B. None

C. Two

D. Three

40. Suppose that f is a continuous real-valued function defined on the closed interval [0,1]. Which of the following are true for constants $C, D, E > 0$ and $x, y \in [0,1]$:
I. There is C such that $| f(x) - f(y) | \leq C, \forall x, y$.
II. There is D such that $| f(x) - f(y) | \leq 1, \forall x, y$ that satisfy $| x - y | \leq D$.
III. There is E such that $| f(x) - f(y) | \leq E \mid x - y \mid \forall x, y$

A. III only

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B. I only

C. I and II only

D. I, II and III

41. Suppose that f is a function on the set of real numbers, and is differentiable twice, and that $f(0), f'(0), f''(0)$ are all negative. Suppose f'' has all the three properties in the interval $[0, \infty)$:
I. It is increasing,
II. It has a unique zero,
III. It is unbounded.
Which of the same three properties does f necessarily have ?

A. II only

B. I only

C. III only

D. II and III only

42. Let $f(x) = 2x^3 + ax^2 + 3x - 5$, and $g(x) = x^3+x^2-4x-9$. Both $f(x), g(x)$ give the same reminder when divided by $x+1$ if a is

A. 10

B. 1

C. 5

D. -5

43. Consider the unit square formed by points in the plane; A(0,0), B(1,0), C(1,1) and D(0,1). Let P be an arbitrary point chosen in this unit square. Connect P to the points A and B. The probability that the points ABP form an obtuse triangle is

A. 0.5

B. 0.393

C. 0.712

D. 0.25

44. Let f and g be two functions defined on an interval I such that $f(x) \geq 0$ and $g(x) \leq 0$, $\forall x \in I$, and f is strictly increasing in I. Then the product function fg is

A. strictly increasing in I with $fg \leq 0$

B. strictly increasing in I with $fg \geq 0$

C. strictly decreasing in I with $fg \leq 0$

D. nothing can be said about it from the given information

45. The derivative of function $f(x)$, where
$$f(x) = \begin{cases} \frac{\sin x^2}{x} & x \neq 0 \\ 0 & x = 0 \end{cases}$$

A. exists at $x = 0$, but is not continuous

B. does not exist at $x = 0$

C. exists at $x = 0$, and is also continuous

D. none of the above

46. If $[x]$ denotes the largest integer $\leq x$, and if $f(x) = x[x]$. $f'(x)$ (where ever it exists) is given by ?

A. [x]

B. 2x

C. 2[x]

D. exists nowhere

47. The sum of the interior angles of a polygon is equal to 86 right angles. Then the number of sides of that polygon is

A. 43

B. 86

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C. 30

D. 45

48. The area of the polygon whose vertices are (x, x), $(x+1, x+1)$, and $(x, x+2)$ is equal to

A. $2x$

B. $x^2/2$

C. 1

D. 2

49. Use the notation $|\ x\ |$ to denote the absolute value of x, and $[x]$ denotes the largest integer smaller or equal to x. For a, an integer, such that $a > 1$ let $f(x)$ be given by

$$f(x) = \begin{cases} |\ |\ x-1\ |-1\ | & x < a \\ [x] & x \geq a \end{cases}$$

Which of the following is the set of points of discontinuity for the function $f(x)$?

A. All integers $> a$

B. All integers $\geq -a$

C. All integers $\geq a$

D. a

50. Consider the function

$$f(x,y) = \begin{cases} \frac{xy}{x^2+y^2} & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$$

Which of the following is NOT true for this function

A. f is continuous along the line $y = 0$

B. f is continuous along the line $x = 0$

C. f is constant along the line $y = x$

D. f is not continuous at $(0,0)$.

51. Suppose a, b, c are all > 0, and if D is the determinant below, which of the following is true about D ?

$$D = \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$$

I. $D > 0$, II. $D < 0$, III. $D = 0$

A. II only

B. I only

C. both I and II

D. both II and III

52. Suppose a, b, c are all > 0, and are in a geometric progression as the successive terms $..., p, q, r, ...$ Then what is the value of the determinant D below? $D = \begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$

A. 1

B. 0

C. pqr

D. $pqr - abc$

53. Consider the determinant

$$\Delta = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$$

Then $\Delta/2$ for all values of θ, lies between

A. 1 and 2

B. 0 and 1

C. 2 and 4

D. > 4

54. Which of the following is equal to the *nullity* of matrix A below ?

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$$A = \begin{bmatrix} -1 & 4 & 2 \\ 1 & 3 & 2 \\ -2 & 1 & 0 \\ 2 & 6 & 4 \end{bmatrix}$$

A. 1

B. 0

C. 2

D. 3

55. How many 2-digit or 3-digit numbers can be formed using the digits 1,3,4,5,6,8, and 9, which are divisible by 4?

A. 64

B. 56

C. 80

D. 92

56. Let $(256)_{10} = (A)_8 \times (B)_{16}$, and if $(B)_{10} = 2 \times (A)_{10}$, then the values of A, B are respectively

A. (6,12)

B. (7,14)

C. (15,30)

D. (10,20)

57. The average temperature of a town in the first four days of a month was 58 degrees. The average for the second, third, fourth. and fifth days was 60 degrees. If the temperatures of the first and fifth days were in the ratio 7:8 the temperature on the fifth day was

A. 62

B. 64

C. 56

D. None of these

58. Two boys A and B speak the truth only 75% and 80% of the time respectively. Lets say both witnessed an incident, what is the percentage of time that the two would contradict each other when narrating the same incident ?

A. 25

B. 15

C. 35

D. 45

59. Solution of the initial value problem $y'' + 5y' - 6y = 0$, given $y(0) = 10; y'(0) = -10$ is

A. $y(t) = 4e^{-6t} + 10e^{t}$

B. $y(t) = \frac{20}{7}e^{6t} + \frac{50}{7}e^{-t}$

C. $y(t) = \frac{20}{7}e^{-6t} + \frac{50}{7}e^{t}$

D. $y(t) = 20e^{-3t} + 30e^{2t}$

60. When 4 dice are thrown, what is the probability that the same number appears on each of them?

A. 1/36

B. 1/1296

C. 1/216

D. 24/216

61. The mean deviation about the median for the data 3, 9, 5,3, 12, 10, 18, 4, 7, 19, 21 is

A. 5.27

B. 1.01

C. 9

D. 10.01

62. Let $g(x) = \int_{-10}^{x} tf'(t)dt$ for $x \geq -10$ where f is an increasing function then

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A. $g(x)$ is a decreasing function of x

B. $g(x)$ is an increasing function of x

C. $g(x)$ is increasing for $x > 0$, and decreasing for $-10 < x < 0$

D. none of these

63. The solution to the indefinite integral $\int \frac{\sqrt{a^2-u^2}}{u^2} du$, is given by

A. $-\frac{1}{u}\sqrt{(a^2-u^2)} - \sin^{-1}\frac{u}{a} + C$

B. $2u^2a^2\sqrt{(a^2-u^2)} - \sin^{-1}\frac{u}{a} + C$

C. $-\frac{1}{u}\sqrt{(a^2-u^2)} - \cos^{-1}\frac{u}{a} + C$

D. $2u^2a^2\sqrt{(a^2-u^2)} - \sinh^{-1}\frac{u}{a} + C$

64. Consider the circles, all of unit radius given by the form $(x-h)^2+(y-k)^2 = 1$. The radius of curvature at any point (x, y) for these circles may be also expressed as

A. $\left[1+(\frac{dy}{dx})^2\right]^2 = (\frac{d^2y}{dx^2})^3$

B. $\left[1+(\frac{dy}{dx})^2\right]^3 = (\frac{d^2y}{dx^2})^2$

C. $\left[1+(\frac{dy}{dx})^2\right]^{3/2} = (\frac{d^2y}{dx^2})^{3/2}$

D. None of these

65. Solution to the differential equation $\frac{d^4y}{dx^4} + 4y = 0$ is

A. $y = e^{-2x}(c_1 \cos x + c_2 \sin x) + e^{2x}(c_3 \cos x + c_4 \sin x)$

B. $y = e^{-x}(c_1 \cos x + c_2 \sin x) + e^{x}(c_3 \cos x + c_4 \sin x)$

C. $y = e^{-x}(c_1 \cos 2x + c_2 \sin 2x) + e^{x}(c_3 \cos 2x + c_4 \sin 2x)$

D. $y = e^{x}(c_1 \cos x + c_2 \cos x) + e^{x}(c_3 \sin x + c_4 \sin x)$

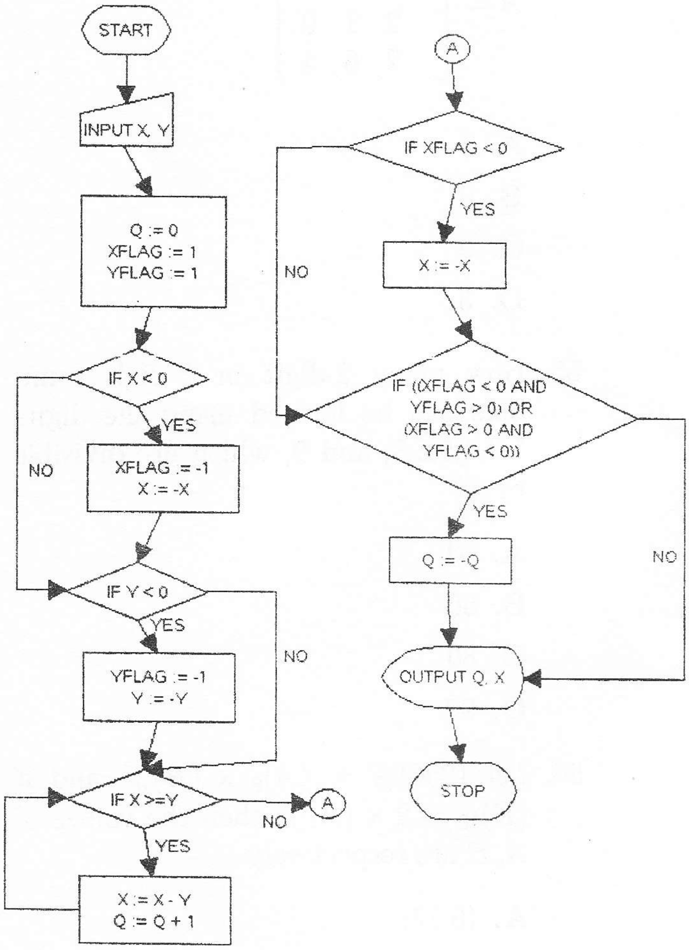
66. The solution to the differential equation $(1+xy)ydx + (1-xy)xdy = 0$ is

A. $\log\frac{x}{y} - xy = c$

B. $\log\frac{x}{y} - \frac{1}{xy} = c$

C. $\log\frac{y}{x} - xy = c$

D. $\log\frac{y}{x} - \frac{1}{xy} = c$



Answer the following 3 questions based on the flowchart given above:

67. What is the output of the flowchart if X = -10 and Y = 3

A. Q = -3 and X = -1

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B. Q = 3 and X = 1

C. Q = -3 and X = 1

D. Q = 6 and X = 1

68. Which of the following conditions can be used in place of the condition "IF ((XFLAG < 0 AND YFLAG > 0) OR (XFLAG > 0 AND YFLAG < 0))"?

A. IF (XFLAG - YFLAG = 2)

B. IF (XFLAG - YFLAG = 0)

C. IF (XFLAG + YFLAG = 2)

D. IF (XFLAG + YFLAG = 0)

69. For what values of X and Y, the flowchart is never going to terminate?

A. X > 0 and Y = 0

B. X < 0 and Y = 0

C. X = 0 and Y = 0

D. All of the above

70. A person speaks truth only 4 times out of 5. A die is tossed and the person says that the die rolled a six. Find the probability that actually there was a six

A. 4/5

B. 2/9

C. 7/9

D. 4/9

71. $\cos A + \cos B$ can also be written as

A. $2\cos\frac{(A+B)}{2}\sin\frac{(A-B)}{2}$

B. $2\cos\frac{(A+B)}{2}\cos\frac{(A-B)}{2}$

C. $2\cos\frac{(A-B)}{2}\sin\frac{(A-B)}{2}$

D. $2\sin\frac{(A+B)}{2}\sin\frac{(A-B)}{2}$

72. The vectors $\lambda i + j + k$, $i + \lambda j - k$ and $2i - j + \lambda k$ are coplanar if:
I: $\lambda = -1$
II: $\lambda = \frac{1\pm\sqrt{5}}{2}$
III: $\lambda = 0$
Which of the following is correct?

A. I and III only

B. I and II only

C. II and III only

D. I, II and III

73. If the vectors $ai + j + k$, $i + bj + k$ and $i + j + ck$ (where a, b *and* $c \neq 1$) are coplanar, then $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} =$

A. $\frac{1}{abc}$

B. 1

C. $\frac{1-abc}{(1-a)(1-b)(1-c)}$

D. 0

74. If $\frac{2\sin\alpha}{1+\cos\alpha+\sin\alpha} = y$ then $\frac{1-\cos\alpha+\sin\alpha}{1+\sin\alpha}$ is equal to

A. y

B. $\frac{1}{y}$

C. $1-y$

D. $1+y$

75. The value of the expression

$$1 - \frac{\cos^2 X}{1+\sin X} + \frac{1+\sin X}{\cos X} - \frac{\cos X}{1-\sin X}$$

is equal to

A. $\sin X$

B. 0

C. $\cos X$

D. 1