JNU - 2002 QUESTION PAPER WITH SOLUTIONS

M.M. : 480 **Time : 3 Hrs.**

Note : +4 Marks for correct response, -1 Marks for incorrect response

1. If α and β are the roots of $4x^2 + 3x + 7 = 0$, then the value of $(1/\alpha)+(1/\beta)$ is **(JNUEE-2002)**
(a) -3/4 (b) - 3/7
(c) 3/7 (d) 4/7 (b)

2. A probability distribution must possess **(JNUEE-2002)**
(a) mean (b) mode
(c) moment generation function
(d) distribution function (d)

3. The ceofficient of x^2 in the expansion of e^{3x+4} is **(JNUEE-2002)**
(a) $9e^2/2$ (b) $9e^4/2$
(c) $3e^4/2$ (d) $3e^2/2$ (b)

5. The value of $(1+i)^4\left(1+\frac{1}{i}\right)^4$ is **(JNUEE-2002)**
(a) 12 (b) - 12
(c) 16 (d) - 16 (c)

7. In a Poisson distribution **(JNU-2002)**
(a) mean and variance are equal
(b) mean is greater than variance
(c) mean is smaller than variance (a)
(d) no relation between mean and variance

8. The vector $\vec{b}\times\vec{c}+\vec{c}\times\vec{a}+\vec{a}\times\vec{b}$, when expressed as a single vector product, is **(JNUEE-2002)**
(a) $(\vec{c}-\vec{a})\times(\vec{c}-\vec{b})$ (b) $(\vec{b}+\vec{a})\times(\vec{c}+\vec{a})$ (a)
(c) $(\vec{a}-\vec{b})\times(\vec{c}-\vec{a})$ (d) $(\vec{b}-\vec{a})\times(\vec{c}-\vec{a})$

9. If A and B are two events, the probability that exactly one of them occurs is **(JNUEE-2002)**
(a) $P(A)+P(B)-2P(A\cap B)$ (a)
(b) $P(A)+P(B)-P(A\cap B)$
(c) $P(A^c)+P(B^c)-2P(A^c\cap B^c)$
(d) $P(A\cap B^c)+P(A^c\cap C)$

10. Special software to create a job queue is called a/an **(JNUEE-2002)**
(a) driver (b) spooler (b)
(c) interpreter (d) linkage editor

11. Which of the following is incorrect ? **(JNUEE-2002)**
(a) $|a+b|\le|a|+|b|$ (b) $|a-b|\le|a|+|b|$ (c)
(c) $|a-b|\le|a|-|b|$ (d) $|a-b|=0 \Leftrightarrow a=b$

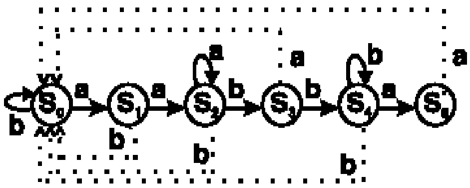
12. If $p^2 + q^2 = 1$ and $X = (3p - 4p^3)^2 + (3q - 4q^3)^2$, then the value of X is **(JNUEE-2002)**
(a) 1 (b) 3
(c) 6 (d) 12 (a)

13. Let $A_\theta = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then which of the following is incorrect ? **(JNUEE-2002)**
(a) $A_\alpha A_\beta \ne A_\beta A_\alpha$ (b) $A_\alpha A_\beta = A_{\alpha+\beta}$
(c) $A_\alpha A_{-\alpha} = I$ (d) $(A_\alpha)^n = A_{n\alpha}$ (a)

14. .... must be applied to access an element of a stack. **(JNUEE-2002)**
(a) Top (b) Pop
(c) Push (d) Exit (b)

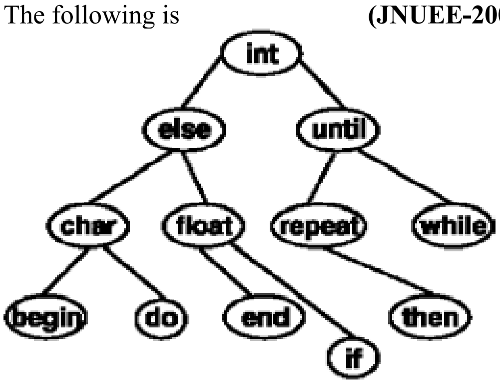
15. In the following code fragment
```
i = 0 ;
while (............)
(printf ("hello/n");
i ++ ;
)
```
the condition for the while loop to execute 20 times is **(JNUEE-2002)**
(a) i < 20 (b) i < = 20
(c) !i < 20 (d) i = 20
(a)

16. Which of the following strings does not contain the pattern recognized by the given pattern matching graph ? **(JNUEE-2002)**



(a) aabba (b) aaabbbbaaa
(c) abaabbaaabbb (d) abaabaaabbb (c)

20. The following is **(JNUEE-2002)**



(a) Heap (b) Binary search tree
(c) Complete binary tree (d) N.O.T. (a)

22. Turnaround time is **(JNUEE-2002)**
(a) the time a program waits before execution starts
(b) the start time (d)
(c) the execution time
(d) the time between start and the end of the program

23. The angle between the tangents from the point (4, 3) to the circle $x^2 + y^2 - 2x - 2y = 0$ is **(JNUEE-2002)**
(a) $\pi/2$ (b) $\pi/3$
(c) $\pi/4$ (d) N.O.T. (d)

24. Given below are the decimal numbers with the correcponding 10's complements. Which of the following is an incorrect pair ? **(JNUEE-2002)**

Decimal No.	**10's complement**	
(a) 7392	2608	
(b) 3754	6264	
(c) 81.75	19.25	
(d) 34.56	65.44	(a)

25. In artificial intelligence, Brain : Computer : : Knowledge : .... **(JNUEE-2002)**
(a) Storage (b) Data
(c) Analysis (d) Synthesis (a)

26. The least integer n such that $7^n > 10^5$ given log 343 = 2.5353 is **(JNUEE-2002)**
(a) 3 (b) 4
(c) 5 (d) 6 (d)

27. The value of $\cos(2\cos^{-1}x + \sin^{-1}x)$ for $0 \le \cos^{-1}x \le \pi$ and $-\pi/2 \le \sin^{-1}x \le \pi/2$ at x = 1/3, is
(a) $-2/\sqrt{3}$ (b) $-2\sqrt{3}$
(c) $(2\sqrt{2})/\sqrt{3}$ (d) $-(2\sqrt{2})/3$ (d) **(JNU-2002)**

28. Which of the following transmission systems provide the highest data rate to an individual device ?
(a) Computer bus (b) Voice band modem
(c) Telephone line (d) Leased line (d) **(JNU-2002)**

29. Consider the propositions, P :I am at home ; Q : I am unwell ; R : I am outdoors ; S :I am outdoors only if I am well. In terms of the above propositions and the logic connectives, S can be written as
(a) $\sim P \to Q$ (b) $R \to Q$
(c) $\sim R \to Q$ (d) $R \to \sim Q$ (d) **(JNU-2002)**

30. Consider the production rules of a grammer $G, S \to A\ , A \to a\ , B \to b$. The language generated by G is
(a) L (G) = (aaaa, bbbb, abba, baab)
(b) L (G) = (abab, baba, aaba, abaa)
(c) L (G) = (aaaa, aabb, bbaa, bbbb)
(d) L (G) = (aaaa, abba, bbaa, bbbb) **(JNU-2002)**

31. If the cube roots of unity are $1, \omega, \omega^2$ then the roots of the equation $(x-1)^3 + 8 = 0$ are
(a) $-1, 1+2\omega, 1+2\omega^2$ (b) $-1, 1-2\omega, 1-2\omega^2$
(c) -1, -1, -1 (d) N.O.T. (b) **(JNU-2002)**

33. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$ then $\cos\theta - \sin\theta$ is equal to
(a) $\sqrt{2}\sin\theta$ (b) $\sqrt{2}\sec\theta$
(c) $\sin\theta/\sqrt{2}$ (d) $\cos\theta/\sqrt{2}$ (a) **(JNU-2002)**

35. Third generation computers
(a) were the first to use built-in error detecting devices
(b) used transistors instead of vacuum tubes
(c) were the first to use neural network
(d) N.O.T. (b) **(JNU-2002)**

36. If $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}, \vec{a} \ne 0$ then
(a) $\vec{b} = \vec{c} + \lambda\vec{a}$ (b) $\vec{c} = \vec{a} + \lambda\vec{b}$

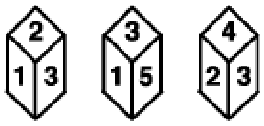
(c) $\vec{c} = \vec{b} + \lambda \vec{c}$ (d) N.O.T. (a) **(JNU-2002)**

37. The primary memory of a personal computer consists of **(JNU-2002)** (c)
(a) ROM only (b) RAM only
(c) Both RAM and ROM (d) Memory module

38. If $a\cos 2\theta + b\sin 2\theta = c$ has two solutions θ_1 and θ_2 then $\tan(\theta_1 + \theta_2)$ is equal to
(a) b/a (b) a/b
(c) (c - a)/b (d) b/(a + c) (a) **(JNU-2002)**

39. A number is chosen from each of the two sets (1,2,3,4, 5,6,7,8, 9) and (1,2,3,4, 5,6,7,8, 9). If p_1 denotes the probability that the sum of the two numbers be 10 and p_2 the probability that their sum be 8, then $(p_1 + p_2)$ is
(a) 7/729 (b) 137/729
(c) 16/81 (d) 137/81 (c) **(JNU-2002)**

40. What should be the number opposite to 3 ?



(a) 1 (b) 6
(c) 5 (d) 4 (b) **(JNU-2002)**

41. If $\sqrt{(p+1)} - \sqrt{(p-1)} = 0,$ then p is a
(a) natural number (b) integer
(c) rational (d) N.O.T. (d) **(JNU-2002)**

42. The number of ways of dividing 15 objects into groups of 7,5,3 respectively is
(a) 15!/(7! 5! 3!) (b) 15! /(7! 3!)
(c) 15!/7! (d) 15! (a) **(JNU-2002)**

43. One of the factors of $\begin{vmatrix} x+a & x & x \\ x & x+a & x \\ x & x & x+a \end{vmatrix}$ is
(a) x + a (b) x + 3a
(c) 3x + a (d) 3x + 3a (c) **(JNU-2002)**

44. The greatest values of $\sin\theta\cos\theta$ is
(a) - 1 (b) 1
(c) -1/2 (d) 1/2 (d) **(JNU-2002)**

45. Which of the following Boolean expressions is true
(a) 2 * 2 + 3 = 10 (b) (2 * 4) and (4 * 3)
(c) (5 * 6) or (3 div 3 = 1)
(d) - 7 * 2 + 2 * 7 = 1 (c) **(JNU-2002)**

46. If $r = r_1 - r_2 - r_3$, then the triangle is
(a) Isosceles (b) Acute angled
(c) Obtuse angled(d) Right angled(d) **(JNU-2002)**

49. Multiplication of 47_8 by 52_8 is
(a) 3144_8 (b) 4147_8
(c) 3184_8 (d) 3146_8 (d) **(JNU-2002)**

50. If SHIP is written as VKLS then PENCIL will be written as
(a) RGPEKN (b) SHQFLO
(c) SHFQLO (d) RGPKEN (b)**(JNU-2002)**

51. If the sum of the root of $px^2 + qx + r = 0$ is equal to the sum of their squares then q^2 is equal to
(a) r(p - 2q) (b) r(2q - p)
(c) p(q - 2r) (d) p(2r - q) (d) **(JNU-2002)**

52. What will be the value of x and y after execution of the following (C language) statement?
n = 5; x = n + +; y = - - x;
(a) 6, 5 (b) 5, 4
(c) 6, 6 (d) 5, 5 (d) **(JNU-2002)**

53. Which of the following is true for testing and debugging?
(a)Testing checks for logical error in the programs,while debugging is a process of correcting those errors in the program
(b) Testing detects the syntax errors in the program while debugging corrects those errors in the program
(c) Testing is independent of debugging
(d) All of the above (b) **(JNU-2002)**

54. A person standing on the bank of a river observes that the angle α subtended by the tree on the opposite bank is twice the angle subtended by it when moves away a distance twice as much as the breadth of the river. Angle α is
(a) π/6 (b) π/12
(c) π/2 (d) π/3 (a) **(JNU-2002)**

55. If log2, $\log(2^x - 1)$ and $\log(2^x + 3)$ are in A.P., then the value of x is given by
(a) $\log_2 5$ (b) $\log_5 2$
(c) $\log_3 5$ (d) $\log_5 3$ (a)**(JNU-2002)**

56. The postfix notation of the arithmetic expression a*((c +d)/a) is
(a) *a/ + cda (b) acd a* +/
(c) acd +* a/ (d) acd + a/* (d) **(JNU-2002)**

58. All the values of x that satisfy the inequalities

$x^2 - 3x + 2 > 0$ and $x^2 - 3x - 4 \leq 0$ are given by
$- 1 \leq x <$ ..... and ..... $< x \leq 4$
(a) 0, 1 respectively (b) 1, 0 respectively
(c) 1, 2 respectively (d) 0, 2 respectively (c) **(JNU-2002)**

59. I/O redirection
(a) implies changing the name of a file
(b) can be employed to use an existing file as input for a program
(c) implies connecting 2 programs through a pipe
(d) none of the above (b) **(JNU-2002)**

63. The equation $x - \frac{2}{(x-1)} = 1 - \frac{2}{(x-1)}$ has
(a) no roots (b) one root (a)
(c) two equal roots (d) infinitely many roots **(JNU-2002)**

64. The equations $3x + y + 2z = 3$, $2x - 3y - z = - 3$, $x + 2y + z = 4$ have (a) infinite number of solutions (b) no solution (c) a unique solution (d) None of these (a) **(JNU-2002)**

66. The missing number in the series
7, 11,—, 17, 19, 23 is
(a) 15 (b) 19
(c) 13 (d) 9 (c) **(JNU-2002)**

68. If $ax^2 + bx + c = 0$, where a ,b, c are all positive, then both roots of the equation will be
(a) real and positive
(b) real and negative
(c) having negative real parts
(d) none of these (c)

69. If $\vec{a}, \vec{b}, \vec{c}$ are any three coplanar vectors, then
(a) $\vec{a}.(\vec{b} \times \vec{c}) = 0$ (b) $\vec{a}.(\vec{b} \times \vec{c}) = 1$
(c) $\vec{a}.(\vec{b} \times \vec{c}) = \vec{a}$ (c) $\vec{a}.(\vec{b} \times \vec{c}) = \vec{b}$ (a)**(JNU-2002)**

70. The probability that a non-leap year should have 53 Sundays is
(a) 53/365 (b) 52/365 (d)
(c) 6/7 (d) 1/7 **(JNU-2002)**

71. If sin(x + y)/ sin(x - y) = (p + q)/(p - q), then (tan x/tan y) is equal to
(a) q/p (b) p/q
(c) pq (d) 1/(pq) (b) **(JNU-2002)**

72. For a frequency distribution of marks in mathematics for 100 students, the average was found to be 80. Later on it was discovered that 48 was misread as 84 . The correct mean is
(a) 80.36 (b) 79.36
(c) 79.64 (c) 80.64 (c)**(JNU-2002)**

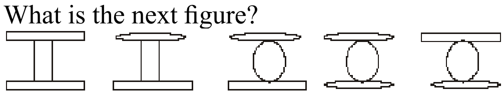
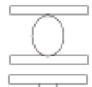
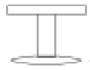
73. If in the expansion of $(x + y)^n$ the coefficients of 4th and 13th terms are equal, then n is
(a) 15 (b) 17 (a)
(c) 9 (d) Cannot be determined **(JNU-2002)**

74. If a, b, c are real number such that $a^2 + b^2 + c^2 = 1$ then ab + bc + ca>............
(a) 1/2 (b) - 1/2
(c) 2 (d) - 2 (d) **(JNU-2002)**

75. Consider the following program segment :
```
j = 2;
while (i % j) j = j + 1;
if (j < i) printf ("%d", j);
```
For a given i > = 2, this program segment prints j only if
(a) i is a prime (b) j does not divide i
(c) j is odd (d) i is not a prime (d) **(JNU-2002)**

76. The average time necessary for the correct sector of a disk to arrive at the read-write head is
(a) Down time (b) Seek time
(c) Rotational delay (d) Access time(b) **(JNU-2002)**

77. Following list of cities is assigned in order to a linear array CITY : Paris, London, New York, Chennai, Koln, Zurich, Mumbai, Delhi, Arlington, Newton, Washington, Rome, Bangkok, Amsterdam, Uppsala. On assigning values to a veriable START and an array LINK, an alphabitical listing of cities with CITY, LINK and START is formed. If i is the index of CITY corresponding to Mumbai, then the values of START and LINK[i] respectively are
(a) 9, 13 (b) 5, 14
(c) 12, 6 (c) 14,10 (d)**(JNU-2002)**

78. What is the next figure?

(a)  (b) 
(c)  (d)  (d) **(JNU-2002)**

80. If a population grows at the rate of 5% per year. it

will double (in years) after
(a) 20 (b) 20 log 2
(c) 2 log 2 (d) 22 (a) **(JNU-2002)**

82. The only integral root of the equation

$$\begin{vmatrix} 2-y & 2 & 3 \\ 2 & 5-y & 6 \\ 3 & 4 & 10-y \end{vmatrix} = 0$$

, is
(a) y = 0 (b) y = 1
(c) y = 2 (d) y = 3 (b)**(JNU-2002)**

84. The solution of the equation | z | = z + 1+ 2i is
(a) (3/2) -2i (b) 3 - 2i
(c) (3/2) + 2i (c) 2 - (3/2) i (a) **(JNU-2002)**

85. A coin is biased so that the probability of head = 1/4. The coin is tossed five times. The probability of obtaining two heads and three tails with heads occurring in succession is
(a) $\frac{(5\times 3^3)}{4^5}$ (b) $\frac{3^3}{5^4}$
(c) $\frac{3^3}{4^5}$ (d) $\frac{3^3}{4^4}$ (d) **(JNU-2002)**

86. The harmonic mean of two numbere is 4. The arithmetic mean A and geometric mean G of these two numbers satisfy the equation $2A + G^2 = 27$. The two numbers are
(a) 3, 6 (b) 4, 5 (a)
(c) 2, 7 (d) None of the above **(JNU-2002)**

87. What is the result of the following program?

```
int f (int& x)
{
x++;
return x;
}
void main()
{
int result, x = 5;
result = f(x) * f(x);
printf (" %d", result);
}
```

(a) 36 (b) 42
(c) 30 (d) 25 (c) **(JNU-2002)**

88. Which of the following is an example of a spooled device?
(a) A line printer used to print the output of a number of jobs
(b) A terminal used to enter data to a running program
(c) A secondary storage device in a virtual memory system
(a)
(d) A graphic display device **(JNU-2002)**

91. The equation $x + e^x = 0$ has
(a) no real root (b) two real roots
(c) one real negative root (d) one real positive root
(JNU-2002)

94. 16 coupons are numbered 0, 1, 2 .... 15. Seven coupons are selected at random. one at a time, with replacement. The probability that the largest number appearing on a selected coupon is 9, is
(a) $(9 / 16)^6$ (b) $(8 / 15)^7$
(c) $(3 / 7)^7$ (d) None of these (d) **(JNU-2002)**

95. The 7th term of the series 3, 9, 20, 38, 65,.........is
(a) 154 (b) 165
(c) 175 (d) 184 (a) **(JNU-2002)**

97. The root of $x^3 - 2x - 5 = 0$, correct to three decimal places by using Newton-Raphson method is
(a) 1.0404 (b) 2.0946
(c) 1.7321 (d) 0.7011(b) **(JNU-2002)**

98. Let A and B be any two arbitrary events, then, which of the following is true?
(a) $P(A\cup B) = P(A) + P(B)$
(b) $P(A\cap B) = P(A)P(B)$
(c) $P(A\mid B) = P(A\cap B)P(B)$
(d) $P(A\cup B) \le P(A) + P(B)$ (d) **(JNU-2002)**

99. In a vectored interrupt
(a) the branch address is assigned to a fixed location in memory
(b) the branch address is obtained from a register in the processor
(c) the interrupting source supplied the branch information to the processor through an interrupt vector
(d) All of the above (d) **(JNU-2002)**

100. A relation over a set S = {3, 6, 9, 12} is defined by {{3, 3},{6, 6}, {9, 9}, {12, 12}, {6, 12}, {3, 9}, {3, 12}, {3, 6}}.Which if the following properties

hold this relation?
(a) Reflexive only
(b) Reflexive and symmetric
(c) Reflexive, symmetric and transitive
(d) Reflexive and transitive (d) **(JNU-2002)**

101.Initialization cannot be part of the definition if the storage class of an array is
(a) static (b) external
(c) automatic (d) None of the above (c) **(JNU-2002)**

102.The area of the triangular region whose sides have the equations y = 2x + 1, y = 3x + 1 and x = 4 is
(a) 9 (b) 7
(c) 10 (d) 8 (d) **(JNU-2002)**

103.If A, B, C are angles of a triangle then the value of

$$\begin{vmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{vmatrix}$$

is
(a) 0 (b) 1
(c) π (d) $\pi/2$ (a) **(JNU-2002)**

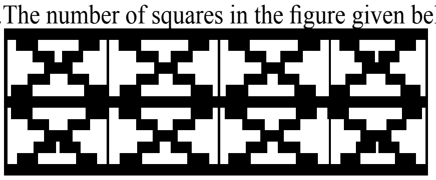
104.The value of $4\left\{{}^nC_1 + 4\cdot{}^nC_2 + 4^2\cdot{}^nC_3 + ... + 4^{n-1}\right\}$ is
(a) 0 (b) $5^n + 1$
(c) 5^n (d) $5^n - 1$ (d) **(JNU-2002)**

105.If λ is an eigen value of a matrix A, then it is a solution to
(a) $(A - \lambda I) = 0$ (b) $\det |A - \lambda I| = 0$
(c) $\det |A - I| = 0$ (d) $\det |A - \lambda| = 0$ (b) **(JNU-2002)**

106.Zero has two representations in
(a) Sign magnitude (b) 1's complement
(c) 2's complement (d) none of the above (a) **(JNU-2002)**

107.Let A be a two dimensional array of 10 rows and 12 columns. If the array is stored in row-major order then the address of the location A [i][j] is
(a) 12j + i + 1 (b) 12i + j + 1
(c) 12j + i (d) 12i + j (d) **(JNU-2002)**

108.The number of squares in the figure given below is



(a) 11 (b) 21
(c) 24 (d) 26 (c) **(JNU-2002)**

110.${}^{n-1}C_3 + {}^{n-1}C_4 > {}^nC_3$ if n > ....
(a) 5 (b) 6
(c) 7 (d) 8 (c) **(JNU-2002)**

111.Let $\tan\alpha = n/(m + 1)$ and $\tan\beta = 1/(2m + 1)$, then the value of $(\alpha + \beta)$ is
(a) $\pi/3$ (b) $\pi/6$
(c) $\pi/2$ (d) $\pi/4$ (d) **(JNU-2002)**

112.For a binomial distribution, the mean is (15/4) and the variance is (15/16). The value of p is
(a) 1/2 (b) 15/16
(c) 1/4 (d) 3/4 (d) **(JNU-2002)**

113.If the roots of $x^2 - bx + c = 0$ are two consecutive integers, then $b^2 - 4c$ is
(a) 0 (b) 1
(c) 2 (d) N.O.T. (b) **(JNU-2002)**

114.If $A = \begin{vmatrix} a^2 & b^2 & c^2 \\ (a+1)^2 & (b+1)^2 & (c+1)^2 \\ (a-1)^2 & (b-1)^2 & (c-1)^2 \end{vmatrix}$

$and\ B = \begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}\ then$

(a) A = 4B (b) A = 2B
(b) A = B (c) None of these (a) **(JNU-2002)**

116.The output of the following program is

```
void iner()
{
static int i;
printf ("%d", ++i);
}
void decr()
{
static int i;
printf ("%d", i--);
}
void main()
{
incr(); decr(); incr();
}
```

(a) 111 (b) 101
(c) 102 (d) garbage (b) **(JNU-2002)**

117.If A, B, C are sets, then A - (B - C) is equivalent to
(a) $(A - B) \cup (A \cap B)$ (b) $(A - B) \cap (A - C)$
(c) $A - (B \cap C)$ (d) $(A - B) \cup (A - C)$ (a) **(JNU-2002)**

118. The default parameter passing mechanism in a C program

(a) call by reference (b) call by value

(c) call by value result (d) None of the above (b) **(JNU-2002)**

119. The sum of the first n terms of the series $1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + ...$ is n (n + 1) /2, when n is even. When n is odd, the sum will be

(a) $n^2(n + 1)$ (b) $n^2(n + 1)/2$

(c) $n^2(n + 1)^2/4$ (d) $n^2(n + 1)/16$ (b)**(JNU-2002)**

SOLUTIONS

1. (b) $\alpha+\beta=-\frac{3}{4}, \alpha\beta=\frac{7}{4}$

$$\frac{1}{\alpha}+\frac{1}{\beta}=\frac{(\alpha+\beta)}{\alpha\beta}=-\frac{3}{7}$$

2. (d)

3. (b) $e^{3x+4}=e^4\left[1+(3x)+\frac{(3x)^2}{2!}+\ldots\right]$

Coeif. of $x^2=\frac{9e^4}{2}$

4. (d) Meeting point of median is the centroid. It thired vertex be (x_3 , y_3) then

$$\frac{-1+5+x_3}{3}=0 \Rightarrow x_3=-4$$

$$\frac{4+2+y_3}{3}=-3 \Rightarrow y_3=-15$$

Required vertex will be (- 4, - 15).

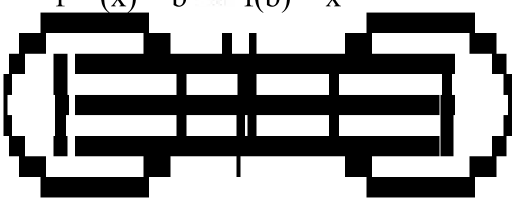
5. (c) $(1+i)^4\left(1+\frac{1}{i}\right)^4$

$=(1+i)^4(1-i)^4$

$= 2^4$

$= 16$

6. (c) f (a) = y
   f (c) = z
   f^{-1} (x) = b $\Rightarrow$ f(b) = x



f is one-one.

7. (a)

8. (a) $\left(\vec{c}+\vec{a}\right)\times\left(\vec{c}-\vec{b}\right)$

$$=\vec{c}\times\vec{c}-\vec{c}\times\vec{b}-\vec{a}\times\vec{c}+\vec{a}\times\vec{b}$$

$$=\vec{b}\times\vec{c}-\vec{c}\times\vec{a}-\vec{a}\times\vec{b}$$

9. (a) Required Probability

$=P(\bar{A}B)+P(A\bar{B})$

$=P(A)+P(B)-2P(A\cap B)$

10. (b) Spooler is a software which creates a queue of many jobs.If your computer is off but spooler is on then it works till end.

11. (c) $|a-b|\le|a|-|b|$ is not true
    hence (c) is in correct.

12. (a) X = $p^2(3-4p^2)^2+q^2(3-4q^2)^2$

$= p^2(4q^2-1)^2+q^2(4p^2-1)^2$

$= 16p^2q^2(q^2+p^2)+(p^2+q^2)-16p^2q^2$

$= 16p^2q^2+1-16q^2q^2$

$= 1.$

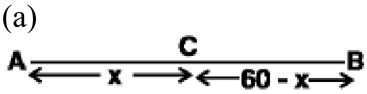
13. (a) Clearly $A_\alpha B_\beta = A_\beta B_\alpha$
    Hence (a) is incorrect.

14. (b) Pop

15. (a) i<20 it execute 20 times
    i<=20 it executes 21 times
    !i<20 wrong statement
    i=20 it executes the value of i=20

16. (c)

17. (a)



Let the school be built at C, x km.away from A.
Distance travelled by the students
= 150 x + 50 (60 - x)
= 3000 + 100x
which is minimum when x = 0, because

$x \geq 0$.

So the school should be built at A.

18.(b) I = $\int_0^{\pi/4} \frac{\sin x + \cos x}{25 + 144 \sin 2x} dx$

take

sin x - cos x = t

(cosx + sin x) dx = dt

sin 2 x = 1 - t^2

I = $\int_{-1}^{0} \frac{dt}{25 + 144(1 - t^2)}$

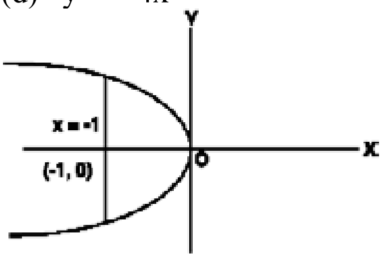
= $\int_{-1}^{0} \frac{dt}{169 - (12t)^2}$

= $\frac{1}{12} \cdot \frac{1}{2 \times 13} \log \frac{13 + 12t}{13 - 12t} \Big|_{-1}^{0}$

= $\frac{1}{312} \cdot [\log_e 1 - \log_e (1/25)]$

= $\frac{2 \log 5}{312} = \frac{1}{156} \log_e 5$

19.(d) $y^2 = -4x$



eqn. of L.R. x = - 1

NOTE:Given ans. are in terms of a , so the eqn. should be $y^2 + 4ax = 0$, in this case the ans. would be x = - a.

20.(a) **Heap:** *Heap is the process to search the tree.*

Complete Binary Tree and Binary Search Tree: *each element have at least two elements left and right.*

21.(a) $\frac{1}{2} |4(4-2) + x(2-6) + 6(6-4)| = 10$

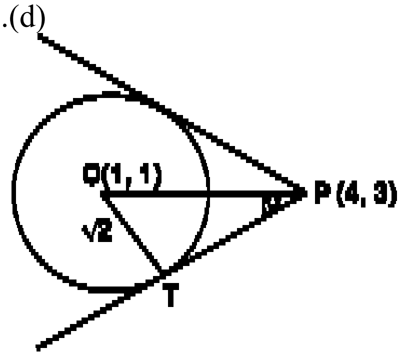
$\Rightarrow |-4x + 20| = 20$

$\Rightarrow x - 5 = \pm 5$

$x = 10, 0$

22.(d)

23.(d)



CT= $\sqrt{2}$

PT= $\sqrt{S_1} = \sqrt{11}$

$\tan \alpha = \sqrt{2} / \sqrt{11}$

$\tan 2\alpha = \frac{2\sqrt{2}/\sqrt{11}}{1 - 2/11}$

$= \frac{2\sqrt{2}\sqrt{11}}{9}$

Hence (d) is the correct ans.

24.(a)

2	7392	
2	3696	0
2	1848	0
2	924	0
2	462	0
2	231	0
2	115	1
2	5	1
2	8	1
2	1	0
2	7	0
2	3	1
2	1	1

1110011100000 decimal to binary
0001100011111 9'scomplement
+1

0001100100000 10's complement

$2^5 + 2^8 + 2^9 = 3 + 256 + 512$

= 800 10's complement binary to decimal

hence (a) is incorrect.

25.(a)

26.(d) $7^n > 10^5 \Rightarrow n \log_{10} 7 > 5$

$\Rightarrow n \dfrac{2.5353}{3} > 5 \Rightarrow 2.5353n > 15$

Obviously least integer n satisfying above inequality is 6.

27.(d) at x = 1/3

Let $\alpha = 2\cos^{-1}1/3$

$\cos(\alpha/2)=1/3$

$\cos\alpha = 2.1/9 - 1 = -7/9$

$\sin\alpha = 4\sqrt{2}/9$

$\beta = \sin^{-1}1/3$

$\sin\beta = 1/3$

$\cos\beta = 2\sqrt{2}/3$

$$\cos(\alpha+\beta) = -\frac{7}{9}.\frac{2\sqrt{2}}{3} - \frac{4\sqrt{2}}{9}.\frac{1}{3}$$

$$= -2\sqrt{2}/3$$

28.(d) **Leased Line:** *Because it directly connects from server to host.*

29.(d) R $\rightarrow$ Q , because if Q then R is true, if Q is wrong then R is also wrong.

30.Question incomplete.

31.(b) $(x - 1)^3 = (-2)^3$

$x - 1 = -2(1)^{1/3}$

$x - 1 = -2.1 \Rightarrow x = -1$

$x - 1 = -2.\omega \Rightarrow x = 1 - 2\omega$

$x - 1 = -2\omega^2 \Rightarrow x = 1 - 2\omega^2$

32.(d) $\dfrac{dy}{dx} = \dfrac{1}{x}$

$$\frac{d^n y}{dx^n} = \frac{d^{n-1}(x^{-1})}{dx^{n-1}}$$

$$= (-1)(-2)(-3)\ldots(-(n-1))\, x^{-n}$$

$$= (-1)^{n-1}(n-1)!\, x^{-n}$$

33.(a) $\tan\theta = \sqrt{2} - 1$

$$\cos\theta = \frac{1}{\sqrt{4-2\sqrt{2}}},$$

$$\sin\theta = \frac{\sqrt{2}-1}{\sqrt{4-2\sqrt{2}}}$$

$$2\sqrt{2}\sin\theta = \sqrt{4-2\sqrt{2}}$$

$$\cos\theta - \sin\theta = \frac{2-\sqrt{2}}{\sqrt{4-2\sqrt{2}}}$$

$$= \frac{\sqrt{4-2\sqrt{2}}}{2}$$

$$= \frac{2\sqrt{2}\sin\theta}{2}$$

$$= \sqrt{2}\sin\theta.$$

34 .(b) $\int_{-3}^{3} |x| dx = 2\int_{0}^{3} x\,dx = 9$

35.(b)

36.(a) $\vec{a}\times\vec{b} - \vec{a}\times\vec{c} = 0$

$$\Rightarrow \vec{a}\times(\vec{b}-\vec{c}) = 0$$

$$\Rightarrow \vec{b}-\vec{c} = \lambda\vec{a}$$

$$\Rightarrow \vec{b} = \vec{c} + \lambda\vec{a}$$

37.(c)

38.(a) $a\cos 2\theta + b\sin 2\theta = c$

$$\frac{a(1-\tan^2\theta)}{1+\tan^2\theta} + \frac{b.2\tan\theta}{1+\tan^2\theta} = c$$

$$(c+a)\tan^2\theta - 2b\tan\theta + c - a = 0$$

$$\tan\theta_1 + \tan\theta_2 = \frac{2b}{c+a}$$

$$\tan\theta_1\tan\theta_2 = \frac{c-a}{c+a}$$

$$\tan(\theta_1+\theta_2) = \frac{2b(c+a)}{1-(c-a)(c+a)}$$

= b/a

39.(c) $p_1 = \frac{9}{9\times 9}, p_2 = \frac{7}{9\times 9}$

$$p_1 + p_2 = \frac{6}{8}$$

40.(b)

41.(d) $\sqrt{p+1} = \sqrt{p-1}$

$$\Rightarrow p+1 = p-1$$

$$\Rightarrow 2 = 0$$

which is absurd.Hence no sol.

42.(a)

43.(c) $C_1 \to C_1 + C_2 + C_3$

$\Rightarrow$ given determinant

$$= (3x+a)\begin{vmatrix} 1 & x & x \\ 1 & x+a & x \\ 1 & x & x+a \end{vmatrix}$$

Hence 3x + a is one of the factors of the given determinant.

44.(d) $\sin\theta\cos\theta = \frac{1}{2}\sin 2\theta$

greatest value $= \frac{1}{2}\times 1$

= 1/2.

45.(c) (5 * 6) or (3div.3 = 1) or means any one is true.

(3div.3 = 1) $\Rightarrow \frac{3}{3} = 1$ which is true.

46.(d) $r_2 + r_3 = r_1 - r$

$$\frac{\Delta}{s-b} + \frac{\Delta}{s-c} = \frac{\Delta}{s-a} - \frac{\Delta}{s}$$

$$\Rightarrow \frac{s-c+s-b}{(s-b)(s-c)} = \frac{s-(s-a)}{s(s-a)}$$

$$a\,(s-a) = a(s-b)(s-c)$$

$$\frac{(s-b)(s-c)}{s(s-a)} = 1$$

$\Rightarrow \tan^2 A/2 = 1$

$\Rightarrow \angle A/2 = 45^0$

$\Rightarrow \angle A = 90^0$

47.(c) $\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$

$\Rightarrow \tan^{-1} y = \tan^{-1} x + \tan^{-1} a$

$\Rightarrow \frac{y-x}{1+xy} = a$

y - x = a(1 + xy)

48.(b)A and B are given points (a, b), (c, d)

$\frac{PA}{PB} = K \neq 1$

$\Rightarrow$ $PA^2 = K^2 PB^2$

$(x - a)^2 + (y - b)^2 = K^2 [(x - c)^2 + (y - d)^2]$

which is the equation of a circle.

49.(d) $(47)_8 = 7 \times 8^0 + 4 \times 8^1$

$\Rightarrow 7 + 32 = 39$

$(52)_8 = 2 \times 8^0 + 5 \times 8^1 = 42$

39 x 42 = 1638

8	1638	
8	204	6
8	25	4
	3	1

$(3146)_8$

50.(b)

51.(d) $\alpha + \beta = \alpha^2 + \beta^2$

$\Rightarrow \alpha + \beta = (\alpha + \beta)^2 - 2\alpha\beta$

$-\frac{q}{p} = \frac{q^2}{p^2} - 2.\frac{r}{p}$

$-pq = q^2 - 2pr$

$q^2 = 2pr - pq$

$= p(2r - q)$

52.(d) n = 5 , x = n + + , y = - - x

x = n + +

= 5 + +

x = 6

y = - - x ;

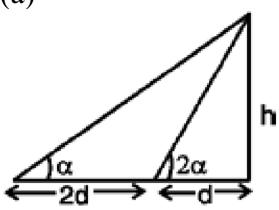
x = 5

y = 5

so x , y = 5 , 5

53.(b) testing checks the error
debug corrects the error.

54.(a)



$\tan 2\alpha = h/d$

$\tan \alpha = h/3d$

$\frac{\tan\alpha}{\tan 2\alpha} = \frac{1}{3}$

$3(1 - \tan^2 \alpha) = 2$

$\Rightarrow \tan^2 \alpha = \frac{1}{3}$

$\alpha = 30^0 = \frac{\pi}{6}$

55.(a) $2 \log(2^x - 1) = \log 2 + \log(2^x + 3)$

$(2^x - 1)^2 = 2(2^x + 3)$

$2^x = t$

$\Rightarrow t^2 - 2t + 1 = 2t + 6$

$t^2 - 4t - 5 = 0$

$(t + 1)(t - 5) = 0$

$t = -1, 5$

$2^x = 5$

$x = \log_2 5$

56.(d)

a* {(c + d)/a

a* { (cd +)/ a}

(sign goes to last as in a + d , ad +)

a* { cd + a / }

acd + a / *

57.(b)

$$f(x)=\begin{cases}2\ , & x<0\\ 0\ , & x=0\\ 0\ , & x>0\end{cases}$$

$$f(0-0)=2, f(0+0)=f(0)=0$$

Hence the given function is continuous everywhere except at x = 0.

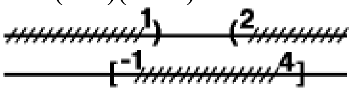
58.(c)

$x^2-3x+2>0$

$\Rightarrow (x-2)(x-1)>0 \Rightarrow x<1$ or $x>2$

also $x^2-3x-4\le 0$

$\Rightarrow (x-4)(x+1)\le 0 \Rightarrow -1\le x\le 4$



Intersection of the two regions gives

$x\in[-1,1)\cup(2,4]$

Hence (c) is the correct answer.

59.(b)

60.(c)

$f(x)=(x-1)^2+1$

hence minimum at x = 1.

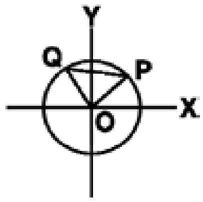
61.(d)

From the given relations

we get

$\frac{x}{a}+\frac{y}{b}=1$ which gives dy/dx = -b/a.

62.(a)



Let PQ subtends 90^0 at the centre.Let midpoint of PQ be (h,k).Equation of PQ

$T = S_1$

i.e. $hx + ky = h^2 + k^2$......(1)

equation of OP & OQ is obtained by making equation of the circle homogenous with the help of (1)

i.e. $x^2+y^2=16((hx+ky)/(h^2+k^2))^2$

since the lines are perpendicular hence

coeff. of x^2 + coeff. of y^2 =0

$\Rightarrow 1+1=16(h^2+k^2)/(h^2+k^2)^2$

$\Rightarrow h^2+k^2=8$

locus will be $x^2+y^2=8$.

ALTERNATIVE SOLUTION:

As a particular case take P(4,0) & Q(0,4) mid point will be (2,2) which satisfies option (a) only.

63.(a)

If we cancel 2/(x-1) ,on both sides, we get x = 1,but in this case 2/(x-1) will not be defined , hence no solution.

64.(a)

$$coeff.\mathbf{det.}=\begin{vmatrix}3 & 1 & 2\\ 2 & -3 & -1\\ 1 & 2 & 1\end{vmatrix}=8\neq 0$$

hence the set of equations has a unique solution.

65.(a)

L.H.L.= -1, R.H.L. = 1

Hence limit does not exist.

66.(c)

7 11 ..... 17 19 23

differ. 4 2 4 2 4

the missing no.= 11 + 2 =17 - 4=13

67.(b)

f = sin(x + y) -x -y = 0

dy/dx = $-f_x / f_y$

$$= -\frac{\cos(x+y)-1}{\cos(x+y)-1}$$

= -1.

68.(c)

$$x = \frac{-b}{2a} \pm \frac{\sqrt{b^2-4a}}{2a}$$

nothing can be said about b^2- 4ac if b^2- 4ac $\leq$ 0 then x has -ive real part. if b^2- 4ac >0

we have $\sqrt{b^2-4a} < b$

$\Rightarrow -b \pm \sqrt{b^2-4a} < 0$

$\Rightarrow x$ is real and -ive.

Hence (c) is the correct option.

69.(a)

70.(d)

71.(b)Apply componendo-dividendo

$$\frac{\sin(x+y)+\sin(x-y)}{\sin(x+y)-\sin(x-y)} = \frac{(p+q)+(p-q)}{(p+q)-(p-q)}$$

$$\frac{2\sin x\cos y}{2\cos x\sin y} = \frac{2p}{2q}$$

$$\Rightarrow \frac{\tan x}{\tan y} = \frac{p}{q}$$

72.(c) Correct mean

$$= \frac{100\times 80 - 84 + 48}{100}$$

$$= \frac{7964}{100}$$

= 79.64

73.(a) ${}^nC_3 = {}^nC_{12}$

$\Rightarrow$n = 3 + 12 = 15

74.(d)

75.(d)

76.(b)

77.(d)

Arlington $\rightarrow$ Amsterdam $\rightarrow$ Bangkok $\rightarrow$ Chennai $\rightarrow$ Delhi $\rightarrow$ Koln $\rightarrow$ Mumbai $\rightarrow$ Newton $\rightarrow$ Newyork $\rightarrow$ Paris $\rightarrow$ Rome $\rightarrow$ Uppsala $\rightarrow$ Washington $\rightarrow$ Zurich

Value of start is 14 because Arlington is in 14th place.

78.(d)

79.(c) $S_1 = 6^2 + (-7)^2 - 14\times 6$

= 1 > 0 outside

80.(a) 2P = P$\left(1+\frac{5}{100}\right)^n$

by Binomial thm.

$$2 \approx 1 + \frac{5}{100}n$$

$\Rightarrow$ n $\approx$ 20Yrs.

Hence (a) is the correct answer

81.(b)

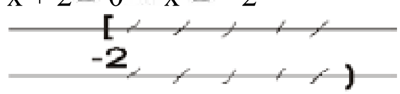
82.(b) y = 1 satisfies the given eqn.

83.(d)

1 - x > 0 $\Rightarrow$ x < 1

1 - x $\neq$ 1 $\Rightarrow$ x $\neq$ 0

x + 2 $\geq$ 0 $\Rightarrow$ x $\geq$ - 2



$x \in [-2,0) \cup (0,1)$

84.(a) z = x + iy

$$\sqrt{x^2+y^2} = x+iy+1+2i$$

y + 2 =0 $\Rightarrow$ y = -2

$\sqrt{x^2 + y^2} = x + 1$

$x^2 + 4 = (x + 1)^2$

$2x = 3$

$x = 3/2$

$z = \frac{3}{2} - 2i$

85.(d)Two successive heads can occur only in 4 ways

HHTTT, THHTT, TTHHT, TTTHH

Req. Prob.

$= 4.(1/4)^2 (3/4)^3 = 3^3/4^4$

86.(a) $G^2 = AH$

$\Rightarrow G^2 = 4A$

$2A + G^2 = 27$

$\Rightarrow A = 9/2, G^2 = 18$

so $a + b = 9$

$ab = 18$

(a) satisties the above equation.

87.(c)

88.(a)

If computer is off and printer is on then for spooling process printing is not stopped.

89.(b) $f(x) = e^{ix(1 + 3 + 5 + ... + (2n - 1))}$

$= e^{ixn^2}$

$f'(x) = i\, n^2 f(x)$

$f''(x) = i\, n^2 .i\, n^2 f(x) = - n^4 f(x)$

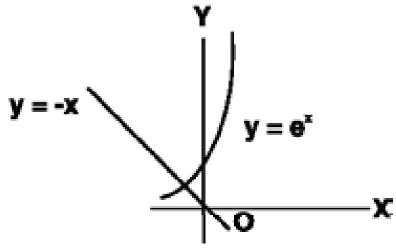
90.(d) $m_1 = -2/3$, $m_2 = ?$

$m_1 m_2 = -\frac{b^2}{a^2} = -\left(1 - e^2\right) = -\frac{2}{3}$

$\Rightarrow m_2 = 1$

other diameter will be $y = x$.

91.(c)



From the figure it is obvious that $x + e^x = 0$ has only one real negative root.

92. (a) $\sin^{-1}\frac{1-x^2}{1+x^2} = \frac{\pi}{2} - 2\tan^{-1} x$

$\sin^{-1}\frac{2x}{1+x^2} = 2\tan^{-1} x$

required derivative = - 1

93.(d) Since centre of the circle is (1, - 2), so any of the vertices can not have abscissae equal to1or ordinate equal to- 2

Hence (d) is the correct answer.

94.(d) Let the number on the selected coupons be $x_1, x_2, ..., x_7$

we need $P[\max(x_1, x_2, ... x_7) = 9]$

$= P[x_1, x_2, ... x_7 \leq 9]$

$- P[x_1, x_2, ... x_7 \leq 8]$

$= \frac{9^7}{15^7} - \frac{8^7}{15^7} = \frac{9^7 - 8^7}{15^7}$

95.(a)

	3	9	20	38	65	......	......
diff.		6	11	18	27	A	B
diff.			5	7	9	11	13

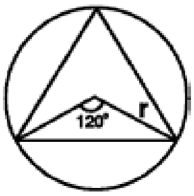
so A = 27+11=38

B = 38+13=51

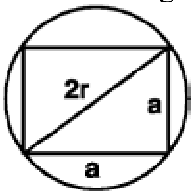
hence 6th term = 65+38=103

7th term = 103+51=154

96.(d)



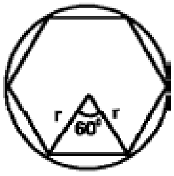
Side of triangle = 2r sin 60^0 = $\sqrt{3}r$



Let side of square = a

$a^2 + a^2 = (2r)^2$

$\Rightarrow a = \sqrt{2}r$



From the figure side of the regular hexagon = r

$\sqrt{3}r$, $\sqrt{2}r$, r are not in A. P. , G. P. or H. P.

97.(b)

98.(d)

99.(d)

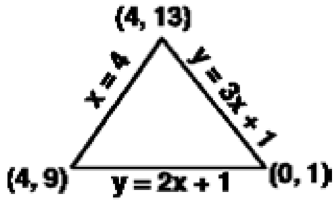
....because all these points are definitions of vector interrupt.

100.(d)

101.(c)

.....because in automatic storage class is extended or reduced automatically.

102.(d)



Area = $\frac{1}{2}\left|4(9-1)+4(1-3\ )+0\right|$

= 8

103.(a) since no option is N.O.T. so take particular values of angles A, B, C

A = B = 45^0

C = 90^0

we get determinant = 0

104.(d) given expression

= $(1 + {}^nC_1 . 4 + {}^nC_2 . 4^2 + ...+ 4^n) - 1$

= $(1 + 4)^n - 1 = 5^n - 1$

105.(b)

106.(a)

107.(d)

108.(c)

109.(a) $I = \frac{1}{2}\int_0^{\pi}(\sin(n-m)x + \sin(n+m)x)dx$

$$= \frac{1}{2}\left(-\frac{\cos(n-m)x}{n-m} - \frac{\cos(n+m)}{n+m} \right)\Bigg|_0^{\pi}$$

$\cos(n - m)\pi = - 1$

$\cos(n + m)\pi = - 1$

because if n - m is odd, so is n + m

$$I = \frac{1}{2}\left[\frac{1}{n-m} + \frac{1}{n+m} + \frac{1}{n-m} + \frac{1}{m+n}\right]$$

$$= \frac{2n}{n^2 - m^2}$$

110.(c) ${}^{n-1}C_3 + {}^{n-1}C_4 = {}^nC_4$

${}^nC_4 > {}^nC_3$

$\Rightarrow n - 3 > 4$

$\Rightarrow \quad n > 7.$

111.(d)

$$\tan(\alpha+\beta)=\frac{\frac{n}{m+1}+\frac{1}{2m+1}}{1-\frac{n}{m+1}\cdot\frac{1}{2m+1}}$$

$$=\frac{2m\quad+m+n+1}{2m^2+3m-n+1}$$

$$\tan(\alpha+\beta)=1$$

if m = n

then $(\alpha+\beta)=\pi/4$

Hence in the equation there should be m in place of n.

112.(d) np = 15/4

npq = 15/16

$\Rightarrow$ q = 1/4

Hence p = 3/4

113.(b) Let the roots be n, n + 1

n + n + 1 = b $\Rightarrow$ n = $\frac{b-1}{2}$

n(n + 1) = c

$$\Rightarrow \frac{b-1}{2}\cdot\left(\frac{b-1}{2}+1\right)=c$$

b^2 - 1 = 4c

b^2 - 4c = 1

114.(a)

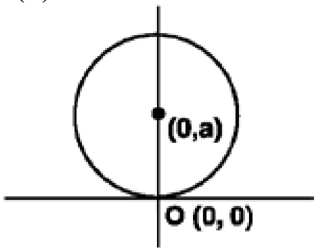
In A $R_2 \to R_2 - R_3$, $R_3 \to R_3 - R_1$

$$A=\begin{vmatrix} a^2 & b^2 & c^2 \\ 4a & 4b & 4c \\ 1-2a & 1-2b & 1-2c \end{vmatrix}$$

$$R_3 \to R_3+\frac{1}{2}R_2$$

$$A=4\begin{vmatrix} a^2 & b^2 & c^2 \\ a & b & c \\ 1 & 1 & 1 \end{vmatrix}=4B$$

115.(b)



If the circles pass thru (0,0) and centre is on the y-axis, then y-axis will be the diameter with origin at one end.

$$x^2+(y-a)^2=a^2$$

$$x^2+y^2-2ay=0$$

$$\frac{x^2+y^2}{y}=2a$$

differentiate w.r. to x

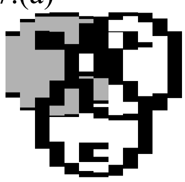
$$\frac{y(2x+2yy')-(x^2+y^2)y'}{y^2}=0$$

$$\Rightarrow(2y^2-x^2-y^2)y'+2xy=0$$

$$(x^2-y^2)\frac{dy}{dx}=2xy$$

116.(b)

117.(a)



$$x\in A-(B-C)$$

$$\Leftrightarrow x\in A \, and \, x\notin(B-C)$$

$$\Leftrightarrow x\in A \, and \, (x\notin B \text{ or } x\in C)$$

$\Leftrightarrow (x \in A \,\&\, x \notin B)\, o\, (x \in A \,\&\, x \in C)$

$\Leftrightarrow x \in A - B\, o\, x \in A \cap C$

$\Leftrightarrow x \in (A - B) \cup (A \cap C)$

118.(b)

119.(b)

This question is wrong.Infact , when n is even, the sum should be
$n(n + 1)^2/2$ in place of $n(n +1)/2$.
When n is odd ,take particular case
n = 1 , sum = 1
only (b) & (c) are true.
Now take n = 3, sum = 18
only (b) is true.Hence (b) is the correct answer.

120.(a)

Focus will be (1,2).Also the circle touches the x-axis at (1,0).Hence radius of the circle will be 2.

Required circle
$(x-1)^2 + (y-2)^2 = 2^2$
i.e. $x^2 + y^2 -2x -4y + 1= 0$.