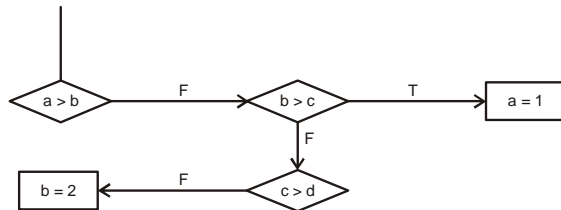


1. Consider the following flow chart :



- | | |
|--|--|
| (a) if (a > b) if (b > c) a = 1; else if (c > d) | (b) if (a <= b) if (b > c) a = 1; else if (c <= d) |
| (c) if (a > b) ; else if (b > c) a = 1; else if (c <= d) b = 2; | (d) if (a <= b) ; else if (b > c) a = 1; else if (c > d) a = 2; |

2. The following program fragment

```

if (a = 0)
    printf("a is zero");
else
    printf("a is not zero");
  
```

result in the printing of

- (a) a is zero (b) a is not zero (c) nothing (d) garbage
3. If y is of integer type then the expressions $3 * (y - 8) / 9$ and $(y - 8) / 9 + 3$
- (a) y is an even number (b) y is an odd number
(c) y-8 is an integral multiple of 9
(d) y - 8 is an integral multiple of 3
4. If the integer needs two bytes of storage, then maximum value of an unsigned integer is :
- (a) $2^{16} - 1$ (b) $2^{15} - 1$
(c) 2^{16} (d) 2^{15}
5. The minimum number of temporary variables needed to swap the contents of two variables is :
- (a) 1 (b) 2
(c) 3 (d) 0
6. Which is true of conditional compilation ?
- (a) It is taken care of by the compiler
(b) It is setting the compiler option conditionally
(c) It is compiling a program based on a condition
(d) It is operation taken by the compiler
7. The basic arithmetic operation performed by a Computer is :
- (a) addition (b) multiplication
(c) subtraction (d) division
8. The base of the binary number system is :
- (a) 2 (b) 16 (c) 8 (d) 10
9. Main memory unit of computer :
- (a) performs arithmetic
(b) stores a small amount of data and instruction
(c) stores bulk of data and instructions
(d) supervises the working of all the units

10. A Central Processing Unit (CPU) consist of :
- (a) input, output unit (b) memory unit
(c) arithmetic and logical unit, central unit
(d) keyboard, printer

Directions : (Question No. 11 & 12) On prepositions may be taken as a drill in the use of preposition. Select the most appropriate preposition carefully and then put your cross against the right answer :

11. He was heart broken her indifference him.
(a) at, to (b) by, for (c) by, to (d) at, on
12. Do not look down the poor.
(a) do (b) upon (c) at (d) in

Directions : (Question No. 13 - 15) In the following questions you have passage, with questions following passages. Read carefully and choose the best answer to each question and mark it in the Answer Sheet :

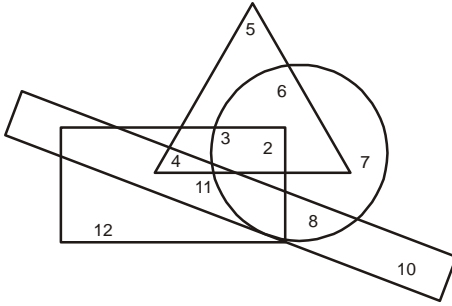
But alas, in 1964, when I was nine, my young life shattered into pieces once again. My mother passed away after an illness of just 15 days. She had been the anchor of my life. And how I missed her. But little children are resilient. My maternal grandmother was staying with us and my mother's widowed younger sister came to help out with us. So well did my aunt fit into our household that in two years my father had married her : she become our mother and her only daughter become our sister.

13. The tone of the passage is :
- (a) gloomy (b) humorous
(c) ironical (d) lyrical
14. The writer's response to his father marrying again is that of :
- (a) indifference (b) disdain
(c) approval (d) disapproval
15. The writer's life got 'shattered into pieces' when :
- (a) his father married again
(b) he lost his mother
(c) he fell seriously ill
(d) a sister was born to him
16. In which of the following countries did the decimal system of numbers originate ?
- (a) England (b) France
(c) India (d) Greece
17. A place which has 2 as the first digit in its PIN Code must be situated in which of the following states ?
- (a) Uttar Pradesh (b) Maharashtra
(c) Gujarat (d) Andra Pradesh
18. Which of the following has been found useful in keeping the level of cholesterol down ?
- (a) serpentina (b) tulsi
(c) turmeric (d) garlic
19. The southernmost point of Indian territory is in which of the following States/Union Territories ?
- (a) Tamil Nadu
(b) Lakshadweep
(c) Kerala
(d) Andaman and Nicobar Island

20. Which of the following diseases usually spreads through air ?

- (a) Plague (b) Tuberculosis
(c) Typhoid (d) Cholera

Directions : (Question No. 21 - 25) The questions (21 to 25) are based on the following diagram in which circle stands for the educated, the square for hard working, the triangle for urban and the rectangle for honest, the diagram are numbered from 1 to 12. Study the diagram and answer each question :



21. Hard working and non-urban people who are neither educated nor honest are indicated by :

- (a) 7 (b) 8
(c) 10 (d) 12

22. Uneducated, urban, hard working and honest people are indicated by :

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

23. Urban hard working who are neither educated nor honest are indicated by :

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

24. Non-urban people educated hard working and honest people are indicated by :

- (a) 7 (b) 8
(c) 9 (d) 10

25. Non-urban people who are honest and hard working but not educated are indicated by :

- (a) 11 (b) 10
(c) 9 (d) 3

26. People should drink more milk because :

- (a) It would help the farmers
(b) It does not keep for a long time
(c) It is sold in many schools
(d) It is a good food

27. Motorists must have driving mirrors in their cars so that :

- (a) Their lady passengers can use them
(b) They can see the traffic behind them
(c) Other motorists can see them
(d) Their head lamps will not dazzle oncoming traffic

28. Glass is used for window's because :

- (a) Glass is Cheap
(b) You can see through glass
(c) A broken window is easily replaced
(d) Glass is easily cut to the right size

29. Many people send Christmas cards to their friends because :

- (a) They are pretty
(b) It is a cheaper to send them, through post
(c) It is the custom to send good wishes to friends at Christmas time in that way
(d) It provides the work for postman

30. A, B, C, D are standing at the corners of a square field. They walk along the sides of the square in the clockwise direction. They stop after covering four sides which one of the following statement is true ?

- (a) C is North - East of B (b) D is East - West of A
(c) A is West of B (d) B is East - South of D

31. A' is mother is sister of B and has a daughter C. How is A related to B ?

- (a) Niece (b) Uncle (c) Daughter (d) Father

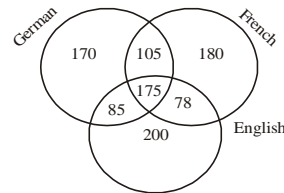
32. A is brother of B and C; D is C's mother D is B's sister and E is B's sister. How is C related to E ?

- (a) Niece (b) Cousin (c) Aunt (d) Mother

33. Out of five friends A is shorter than B but taller than E. C is tallest and D is little shorter than A. Which one is the shortest ?

- (a) A (b) E
(c) C (d) D

34. In a row at a bus stop A is 7th from the left and B is 9th from the right. They both interchange their positions. A becomes 11th from the left. How many people are there in the row ?



- (a) 18 (b) 19
(c) 20 (d) 21

35. A man drove his car straight towards east for 5 km. Then he turn right and drove for 4 km and then the turned to his south and drove for 3 km. How far was he from the starting point ?

- (a) 6km (b) 5km
(c) 7km (d) 8km

Directions : (Question No. 36 - 40) A and B are good at hockey and Volley ball. C and A are good at Hockey and Baseball. D and B are good at Cricket and Volley ball. D and E are good as Football and Baseball. Study the above given information and answer the following questions :

36. Who is good of the largest number of games ?

- (a) E (b) D (c) C (d) B

37. Who is good at Cricket, Hockey and Volleyball ?

- (a) E (b) D (c) C (d) B

38. Who is good at Baseball, Volley ball and Hockey ?

- (a) E (b) D (c) C (d) B

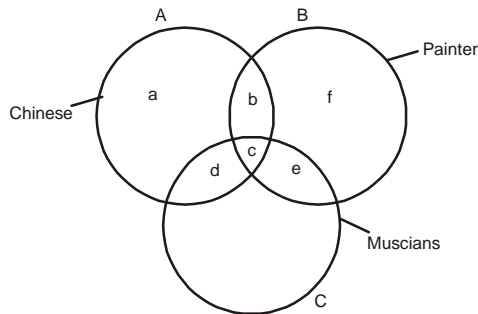
39. Who is good at Cricket, Baseball and Volley ball ?

- (a) E (b) D (c) C (d) B

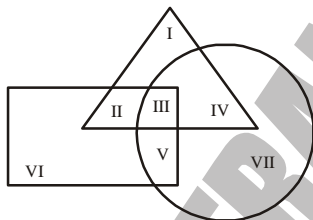
40. Who of the following is good at all the four games ?

- (a) E (b) D (c) C (d) B

Directions : (Question No. 41 - 44) In the figure given below, there are three interesting circles each representing certain section of people. Different regions are marked a-g. Read the statements in each of the following questions and choose the letter of the region which correctly represents the statement :



41. Chinese who are painters as well as musicians :
 (a) a (b) b
 (c) c (d) d
42. Chinese who are musicians but not painter :
 (a) d (b) c
 (c) b (d) a
43. Painter who are neither Chinese nor musicians :
 (a) b (b) c
 (c) f (d) g
44. Chinese who are painters but not musicians :
 (a) b (b) c
 (c) d (d) g
45. The triangle, square and circle shown below respectively represent the urban, hard working and educated people. Which one of the areas marked I-VII is represented by the urban educated people who are not hard working ?



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

Directions : (Question No. 46 - 50) Vijay starts from his home with his wife at 9.30 a.m. on his scooter. He goes 1 km east, drop his wife at her office, turns left, goes another km then turns right, and after a km reaches the bank where he spends five minutes. Then he turn towards north and reaches hospital which is one km from the bank. After taking to a doctor friend for five minutes he turns towards west and reaches his office, which is 2 km form the hospital at 9.58 a.m.

Now answer the following questions :

46. At what time did Vijay reach the bank ?
 (a) 9.42 a.m. (b) 9.39 a.m.
 (c) 9.45 a.m. (d) 9.36 a.m.

47. What is the average speed ?
 (a) 18 km per hour (b) 25 km per hour
 (c) 30 km per hour (d) 20 km per hour
48. How much time would Vijay had taken in reaching his office by the same route if he had not stopped at the bank and hospital ?
 (a) 20 minutes (b) 23 minutes
 (c) 18 minutes (d) 13 minutes
49. How far is the hospital from his wife's office ?
 (a) 3 km (b) 4 km (c) 4½ km (d) 1km
50. How far is Vijay's office from his home as the crow flies ?
 (a) 3km (b) 4km
 (c) 2km (d) 5km
51. If α, β be two directions of projection to hit a given point (h, k), then :
 (a) $\cos(\alpha + \beta) = -\frac{h}{k}$ (b) $\sin(\alpha + \beta) = -\frac{h}{k}$
 (c) $\cot(\alpha + \beta) = -\frac{h}{k}$ (d) $\tan(\alpha + \beta) = -\frac{h}{k}$
52. A shot is fixed at an angle α to the horizontal up an inclined plane of inclination β . It will strike the plane horizontally if :
 (a) $\tan \alpha = \tan \beta$ (b) $2 \tan \alpha = \tan \beta$
 (c) $\tan \alpha = 2 \tan \beta$ (d) $4 \tan \alpha = \tan \beta$
53. If at any instant the velocity of projectile be u and its direction of motion α to the horizon, then it will be moving at right angles to this direction after time :
 (a) $(u/g) \sin \alpha$ (b) $(u/g) \cos \alpha$
 (c) $(u/g) \operatorname{cosec} \alpha$ (d) $(u/g) \sec \alpha$
54. The simple harmonic motion is the motion of a particle which moves in a straight line so that the acceleration is always directed towards a fixed point on the line and varies as the :
 (a) distance from the fixed point
 (b) square of the distance from the fixed point
 (c) reciprocal of the distance from the fixed point
 (d) reciprocal of the square of the distance from the fixed point
55. The singular solution of the differential equaion $y = xp + a\sqrt{1+p^2}$ ($p = \frac{dy}{dx}$) is a : **(BHU-2012)**
 (a) parabola (b) hyperbola
 (c) circle (d) straight line A
56. A mass of 10 kg falls from rest, and is then brought to rest by penetrating 1 m into some sand; the average thrust of the send on it is (taking $g = 10 \text{ m/s}^2$)
 (a) 800 N (b) 900 N (c) 1000 N (d) 1100 N
57. If a particle moves along a plane curve, then its velocity along the normal at every point is :
 (a) zero (b) unity
 (c) finite (d) infinite
58. If a particle moves on a cycloid, then the motion is :
 (a) linear (b) simple harmonic
 (c) simple (d) parabolic

59. If a particle moves along $x = a(2t + \sin 2t)$, $y = a(1 - \cos 2t)$, then acceleration is :
 (a) constant (b) variable
 (c) unknown (d) known
60. The displacement has :
 (a) only magnitude (b) only direction
 (c) both magnitude and direction
 (d) constant negative quantity C
61. Weights W, ω, W , are attached to points B, C, D respectively of a light string AE where B, C, D, divide the string into 4 equal lengths. If the string hangs in the form of 4 consecutive sides of a regular octagon with the ends A and E attached to points on the same level, then :
 (a) $W = 2\omega$ (b) $W = (\sqrt{2} + 1)\omega$
 (c) $W = (\sqrt{2} + 1)\omega$ (d) $W = 4\omega$
62. A uniform rod of weight W rests with its ends in contact with two smooth planes, inclined at angles α and β respectively to the horizon, and intersecting in a horizontal line. The inclination θ of the rod to the vertical is given by :
 (a) $2 \tan \theta = \tan \beta - \tan \alpha$ (b) $2 \tan \theta = \tan \alpha - \tan \beta$
 (c) $2 \cot \theta = \cot \beta - \cot \alpha$ (d) $2 \cot \theta = \cot \alpha - \cot \beta$
63. Let P, Q, R be the sum of the components of various forces acting at a point, in three mutually perpendicular directions. Then the forces are in equilibrium if :
 (a) $P = Q = R$
 (b) $P + Q = Q + R = R + P = 0$
 (c) $P = Q = R = 0$ (d) $P + Q + R = 0$
64. The moments of a system of coplanar forces (not in equilibrium) about three collinear points A, B, C in the plane are G_1, G_2, G_3 . Then :
 (a) $G_1 \cdot AB + G_2 \cdot BC + G_3 \cdot CA = 0$
 (b) $G_1 \cdot BC + G_2 \cdot CA + G_3 \cdot AB = 0$
 (c) $G_1 \cdot CA + G_2 \cdot AB + G_3 \cdot BC = 0$
 (d) $G_1 \cdot G_2 + CA \cdot AB + G_3 \cdot BC = 0$
65. If six forces, of relative magnitudes 1,2,3,4,5 and 6 act along the sides of a regular hexagon, taken in order, then the single equivalent force is of relative magnitude :
 (a) 1 (b) 3
 (c) 5 (d) 6
66. ABCD ... is a polygon of n sides, and forces act at a point parallel and proportional to AB, 2BC, 3CD, etc. If O be the centroid of all the points B, C, D, including A, then their resultant is parallel and proportional to :
 (a) $(n - 2) OA$ (b) $(n + 1) OA$
 (c) nOA (d) $(n - 1) OA$
67. Two forces given in magnitude at each through a fixed point, and are inclined at a constant angle θ . If θ varies, then the locus of A is :
 (a) a straight line
 (b) a circle
 (c) a parabola
 (d) an ellipse
68. If three forces acting at a point are represented in magnitude and direction by three sides of a triangle, taken in order, they are in equilibrium. This condition

is :

- (a) only necessary and not sufficient
 (b) only sufficient but not necessary
 (c) both necessary as well as sufficient
 (d) neither necessary nor sufficient
69. The resultant of P and Q is R. If Q is doubled, R is also doubled. If Q is reversed, R is again doubled. The $P^2 : Q^2 : R^2$ is given by :
 (a) 1 : 1 : 1 (b) 2 : 2 : 3
 (c) 2 : 3 : 2 (d) 3 : 2 : $\sqrt{2}$
70. In the Linear Programming Problem :
 Maximize $z = 4x + y$
 Subject to :
 $3x + 5y \leq 15$
 $5x + y \leq 15$
 $-x + y \leq 2$
 $4x + 5y \leq 20$
 $x, y \geq 0$,
 has :
 (a) no solution (b) one solution
 (c) infinite solution (d) finite solution
71. Fit a straight line regression of Y on X from the following table :

| | | | | | | | |
|-----|---|---|---|---|---|---|---|
| X : | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| Y : | 2 | 1 | 3 | 2 | 4 | 3 | 5 |

 (a) $Y = 0.35 + 1.578 X$ (b) $Y = 1.578 + 0.35 X$
 (c) $Y = 1.357 + 0.5 X$ (d) $Y = 0.5 + 1.357 X$
72. The value of the correlation coefficient between two variables lies between :
 (a) 0 and ∞ (b) $-\infty$ and ∞
 (c) 0 and 1 (d) -1 and 1 D
73. In the method of least square of curve fitting, if n are constants, then the normal equations are :
 (a) n^2 (b) n
 (c) n (d) $n + 1$ B
74. For a normal curve the greatest ordinate is :
 (a) $\frac{1}{\sigma\sqrt{2\pi}}$ (b) $\frac{1}{\sqrt{2\pi}\sigma}$
 (c) $\sigma\sqrt{2\pi}$ (d) $2\pi\sigma$ A
75. In case of Poisson distribution :
 (a) mean > variance (b) mean < variance
 (c) mean = variance
 (d) mean and variance are not related C
76. The variance of Binomial distribution is :
 (a) np (b) $1 - np$
 (c) npq (d) $\pm \sqrt{n - pq}$ C
77. For a frequency distribution standard deviation is computed by using the formula :
 (a) $\sigma = \frac{\sum f(x - \bar{x})}{\sum f}$ (b) $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$
 (c) $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$ (d) $\sigma = \sqrt{\frac{\sum f(x - \bar{x})}{\sum f}}$ C

78. If the sizes in the frequency distribution are given in an ascending order of magnitude, then the median is calculated by :

(BHU-2012) B

(a) $M_d = 1 + \left(\frac{\frac{N}{2} + C}{f} \right) x_i$ (b) $M_d = 1 + \left(\frac{\frac{N}{2} - C}{f} \right) x_i$

(c) $M_d = 1 - \left(\frac{\frac{N}{2} + C}{f} \right) x_i$ (d) $M_d = 1 - \left(\frac{\frac{N}{2} - C}{f} \right) x_i$

79. The average of n numbers $x_1, x_2, x_3, \dots, x_n$ is M . If x_1 is replaced by x' , then the new average is :

(a) $M - x_1 + x'$ (b) $\frac{M - x_1 + x'}{n}$
 (c) $\frac{(n-1)M - x_1 + x'}{n}$ (d) $\frac{nM - x_1 + x'}{n}$ D

80. In a box containing 100 bulbs, 10 are defective. What is the probability that out of a sample of 5 bulbs, none is defective ?

(a) 10^{-5} (b) $(1/2)^5$
 (c) $(9/10)^5$ (d) $9/10$ A

81. A single letter is selected at random from the word "PROBABILITY". The probability that is a vowel, is :

(a) $3/11$ (b) $4/11$ (c) $2/11$ (d) 0 B

82. In a single throw with two dice, the chances of throwing eight is :

(a) $7/36$ (b) $1/18$ (c) $1/9$ (d) $5/36$ D

83. The probability that A, B, C can solve problem is

$\frac{1}{3}, \frac{1}{3}, \frac{1}{3}$ respectively they attempt independently, then the probability that the problem will solved is :
 (a) $1/9$ (b) $2/18$
 (c) $4/9$ (d) $2/3$ W

84. The value of $\cos^{-1} \left(\frac{\sqrt{2}}{3} \right) - \cos^{-1} \left(\frac{\sqrt{6}+1}{2\sqrt{3}} \right)$ is equal to :

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

85. If $\sin^{-1} x + \cos^{-1} (1/2) = \pi/2$, then x is :

(a) 0 (b) $\frac{2}{\sqrt{3}}$ (c) $\frac{1}{\sqrt{5}}$ (d) $\frac{\sqrt{3}}{2}$ W

86. The solution of the equation

$3 \sin^{-1} \left(\frac{2x}{1+x^2} \right) - 4 \cos^{-1} \left(\frac{1-x^2}{1+x^2} \right) + 2 \tan^{-1} \left(\frac{2x}{1-x^2} \right) = \frac{\pi}{3}$ is :

(a) $x = \sqrt{3}$ (b) $x = \frac{1}{\sqrt{3}}$

(c) $x = 1$ (d) $x = 0$ B

87. If the angles of elevation of the top and bottom of a flag staff fixed at the top of a tower at a point distant a from the foot of a tower are α and β , then height of the flag staff is :

(a) $a(\sin \alpha - \sin \beta)$ (b) $a(\cos \alpha - \cos \beta)$
 (c) $a(\cot \alpha - \cot \beta)$ (d) $a(\tan \alpha - \tan \beta)$

88. If the angle of elevation of a cloud at a height h above the level of water in a lake is α and the angle of depression of its image in the lake is β , then the height of a cloud above the surface of the lake is not correct :

(a) $\frac{h(\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha}$ (b) $\frac{h \sin(\alpha + \beta)}{\sin(\beta - \alpha)}$

(c) $\frac{h(\cot \alpha + \cot \beta)}{\cot \alpha - \cot \beta}$ (d) $\frac{h \cos(\alpha + \beta)}{\sin(\beta - \alpha)}$

89. If $y = \sec^{-1} \left(\frac{x+1}{x-1} \right) + \sin^{-1} \left(\frac{x-1}{x+1} \right)$, then $\frac{dy}{dx}$ is :

(a) 1 (b) 0

(c) $\frac{x-1}{x+1}$ (d) $\frac{x+1}{x-1}$ (BHU-2012) B

90. If $\sin x + \sin^2 x = 1$, then the value of $\cos^{12} x + 2 \cos^{10} x + 3 \cos^8 x + \cos^6 x$ is equal to :

(a) -1 (b) 0 (c) -2 (d) 2

91. The maximum value of $\frac{\log_e x}{x}$ is : (BHU-2012)

(a) 1 (b) $2/4$ (c) e (d) $1/e$ D

92. If $A + B + C = \pi$ and $x = \sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2}$, then :

(a) $x \geq \frac{1}{8}$ (b) $x \leq \frac{1}{8}$ (c) $x \geq \frac{1}{2}$ (d) $x \leq \frac{1}{2}$

93. The value(s) of $\cos \frac{\pi}{7} \cos \frac{4\pi}{7} \cos \frac{5\pi}{7}$ is (are) :

(a) $-\frac{1}{8}$ (b) $-\frac{1}{4}$ (c) $\frac{1}{8}$ (d) $-\frac{1}{4}$

94. If $\operatorname{cosec} A + \cot A = 5/2$, then $\tan A$ is :

(a) $4/9$ (b) $3/5$
 (c) $15/16$ (d) $20/21$

95. The point of intersection of the lines

$\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$ is :

(a) \vec{a} (b) \vec{b} (c) $\vec{a} + \vec{b}$ (d) $\vec{a} - \vec{b}$

96. What is the value of

$(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) \times (\vec{a} \times \vec{c}) \times (\vec{d} \times \vec{b}) \times (\vec{a} \times \vec{d}) \times (\vec{b} \times \vec{c})$?

(a) $2[\vec{a} \vec{d} \vec{c}] \vec{b}$ (b) $2[\vec{b} \vec{d} \vec{c}] \vec{a}$

(c) $2[\vec{a} \vec{c} \vec{d}] \vec{b}$ (d) $2[\vec{b} \vec{c} \vec{d}] \vec{a}$

97. If $\vec{a}, \vec{b}, \vec{c}$ are vectors from the origin to the point A, B, C, then $(\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a})$
- perpendicular to the plane ABC
 - parallel to the plane ABC
 - lies in the plane ABC
 - is null vector
98. The volume of the parallelepiped whose edges are represented by $2\hat{i} - 3\hat{j} + 4\hat{k}$, $\hat{i} + 2\hat{j} - \hat{k}$ and $3\hat{i} - \hat{j} + 2\hat{k}$ is:
- 10
 - 7
 - 6
 - 5
99. Which of the following is correct ?
- $(\vec{a} \times \vec{b}) = (\vec{a} \cdot \vec{b})^2 + a^2 \times b^2$
 - $(\vec{a} \times \vec{b})^2 = (\vec{a} \cdot \vec{b})^2 - a^2 \times b^2$
 - $(\vec{a} \times \vec{b})^2 + (\vec{a} \cdot \vec{b})^2 = a^2 b^2$
 - $(\vec{a} \times \vec{b})^2 + (\vec{a} \cdot \vec{b})^2 - a^2 b^2 = 0$
100. If $\vec{a}, \vec{b}, \vec{c}$ be three non-coplanar vectors, then the cross product is :
- distributive over scalar product of vectors
 - not distributive over scalar product of vectors
 - distributive over addition of vectors
 - not distributive over addition of vectors
101. The angle between two non-zero vectors \vec{a} and \vec{b} is given by :
- $\sin^{-1} \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$
 - $\cos^{-1} \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$
 - $\sin^{-1} \frac{|\vec{a} \cdot \vec{b}|}{|\vec{a}| |\vec{b}|}$
 - $\cos^{-1} \frac{|\vec{a} \cdot \vec{b}|}{|\vec{a}| |\vec{b}|}$
102. The point of intersection of the line $\vec{r} = \vec{a} + \vec{b} + t\vec{c}$ and the plane $\vec{r} = \vec{a} - \vec{b} + t_1(\vec{a} + \vec{b} - \vec{c}) + t_2(\vec{a} - \vec{b} + \vec{c})$ is :
- $2\vec{a} - 3\vec{b} + 4\vec{c}$
 - $2\vec{a} - 3\vec{b} - 4\vec{c}$
 - $2\vec{a} + 3\vec{b} + 4\vec{c}$
 - $2\vec{a} + 3\vec{b} - 4\vec{c}$
103. The area of the triangle having vertices (1, 3, 2), (2, -1, 1) and (-1, 2, 3) is :
- $\frac{1}{2}\sqrt{107}$
 - $\frac{1}{2}\sqrt{155}$
 - $\frac{1}{2}\sqrt{165}$
 - $\frac{1}{2}\sqrt{187}$
104. The system of vectors are :
- Never closed under addition and multiplication
 - Closed under addition and in a restricted sense in multiplication

- Closed under addition and multiplication
 - Closed under addition only
105. Which of the following differential equations can be reduced to homogeneous form ?
- $y(e^x + x^2 y)dx - e^x dy = 0$
 - $x^3 \frac{dy}{dx} - x^3 y + y^4 \cos x = 0$
 - $(4x + 6y + 5)dx = (2x + 3y + 4)dy$
 - $(1 + y^2)dx + (x - \sin y)dy = 0$
106. Which of the following differential equation is linear ?
- $(1 + y) \frac{dy}{dx} + \cos x = 0$
 - $x + y \frac{dy}{dx} = 0$
 - $\frac{d^2 y}{dx^2} + x^2 \frac{dy}{dx} + (1 + x)y = e^x$
 - $(1 + y) \frac{d^2 y}{dx^2} + xy = e^x + x$ (BHU-2012)
107. The differential equation $y = px + f(p)$ is called of :
- Clairut's form
 - Newtonian form
 - Bernoulli's form
 - Euler's form
108. If r is a radius and k is thickness of a frustum of a sphere, then its curved surface of frustum is :
- $\frac{1}{2} \pi rk$
 - πrk
 - $2 \pi rk$
 - $4 \pi rk$
109. If h is height and r_1, r_2 are the radii of the end of the frustum of a cone, then the volume of the frustum is :
- $\frac{\pi h}{3}(r_1^2 - 3r_1 r_2 + r_2^2)$
 - $\frac{\pi h}{3}(r_1^2 + 3r_1 r_2 + r_2^2)$
 - $\frac{\pi h}{3}(r_1^2 - r_1 r_2 + r_2^2)$
 - $\frac{\pi h}{3}(r_1^2 + r_1 r_2 + r_2^2)$
110. The value of $\int_0^{\pi/2} \log(\tan x) dx$ is equal to :
- 0
 - $x/4$
 - $x/2$
 - π
111. The value of $\int \frac{x + \sin x}{1 + \cos x} dx$ is :
- $x \cot \frac{x}{2}$
 - $x \tan \frac{x}{2}$
 - $x \sin \frac{x}{2}$
 - $x \cos \frac{x}{2}$
112. The value of $\int \frac{xe^x}{(x+1)^2} dx$ is :
- $\frac{1}{x+1} e^x$
 - $(x-1)^2 e^x$
 - $(x-1) e^x$
 - e^x
113. If x and y be two real variable, such that $x > 0$ and $xy = 1$, then the minimum value of $x + y$ is : (BHU-2012)
- 1
 - 1
 - 2
 - 2

114. The condition that the curve $ax^2 + by^2 = 1$ and $a'x^2 + b'y^2 = 1$ should intersect orthogonally is that :

- (a) $a + b = a' + b'$ (b) $a - b = a' - b'$

- (c) $\frac{1}{a} + \frac{1}{b} = \frac{1}{a'} + \frac{1}{b'}$ (d) $\frac{1}{a} - \frac{1}{b} = \frac{1}{a'} - \frac{1}{b'}$ D

115. The equation of tangent at (2, 2) of the curve $xy^2 = 4(4-x)$ is : (BHU-2012)

- (a) $x - y = 4$ (b) $x + y = 4$
(c) $x - y = 2$ (d) $x + y = 2$ B

116. The derivative of $\sin^{-1} \frac{1-x^2}{1+x^2}$ w. r. t. $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$ is :

- (a) -1 (b) 0 (c) $1/x$ (d) x A

117. The function $f(x)$ defined by

$$f(x) = x \left[1 + \frac{1}{3} \sin(\log x^2) \right], \quad x \neq 0$$

$$f(x) = 0, \quad x = 0$$

(BHU-2012)

- (a) $f(x)$ is continuous at $x = 0$
(b) $f(x)$ has discontinuity of first kind at $x = 0$
(c) $f(x)$ has discontinuity of second kind at $x = 0$
(d) $f(x)$ has removable discontinuity at $x = 0$ A

118. $\lim_{n \rightarrow \infty} (1+x)^{1/n}$ is equal to : (BHU-2012)

- (a) 0 (b) 1 (c) e (d) $1/e$ C

119. For the conic $\frac{1}{r} = 1 + e \cos \theta$, the sum of reciprocals of the segments of any focal chord is equal to :

- (a) l (b) $2l$
(c) $1/l$ (d) $2/l$

120. If the line $lx + my = n$ touches the hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \text{ if:}$$

- (a) $a^2 l^2 - b^2 m^2 = n^2$ (b) $al - bm = n$
(c) $a^2 l^2 + b^2 m^2 = n^2$ (d) $al + bm = n$

121. The straight line $x \cos \alpha + y \sin \alpha = p$ touches the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \text{ if:}$$

- (a) $p^2 = a^2 \cos^2 \alpha - b^2 \sin^2 \alpha$
(b) $p^2 = a^2 \cos^2 \alpha + b^2 \sin^2 \alpha$
(c) $p^2 = a^2 \sin^2 \alpha - b^2 \cos^2 \alpha$
(d) $p^2 = a^2 \sin^2 \alpha + b^2 \cos^2 \alpha$

122. The focal distance of a point on the parabola $y^2 = 8x$ is 4. Its ordinates are :

- (a) ± 1 (b) ± 2 (c) ± 3 (d) ± 4

123. The radius of the circle on which the four points of intersection of the lines $(2x - y + 1)(x - 2y + 3) = 0$ with the axes lie, is :

- (a) 5 (b) $\frac{5}{\sqrt{2}}$

- (c) $\frac{5}{2\sqrt{2}}$ (d) $\frac{5}{4\sqrt{2}}$

124. The equation of circle passing through (-1, 2) and concentric with $x^2 + y^2 - 2x - 4y - 4 = 0$ is :

- (a) $x^2 + y^2 - 2x - 4y + 1 = 0$
(b) $x^2 + y^2 - 2x - 4y + 2 = 0$
(c) $x^2 + y^2 - 2x - 4y + 4 = 0$
(d) $x^2 + y^2 - 2x - 4y + 8 = 0$

125. The angle between the two straight line represented by the equation $6x^2 + 5xy - 4y^2 + 7x + 13y - 3 = 0$ is :

- (a) $\tan^{-1} \frac{3}{5}$ (b) $\tan^{-1} \frac{5}{3}$

- (c) $\tan^{-1} \frac{2}{11}$ (d) $\tan^{-1} \frac{11}{2}$

126. The equation of the straight line passing through the point of intersection of $4x + 3y - 8 = 0$ and $x + y - 1 = 0$, and the point (-2, 5) is :

- (a) $9x + 7y - 17 = 0$ (b) $4x + 5y + 6 = 0$
(c) $3x - 2y + 19 = 0$ (d) $3x - 4y - 7 = 0$

127. If m is the mid point of the side BC of the triangle ABC, then :

- (a) $AB^2 + AC^2 = AM^2 + BM^2$
(b) $AB^2 + AC^2 = 2AM^2 + 2BM^2$
(c) $AM^2 + MB^2 = 2AC^2$
(d) $2AB^2 + 2AC^2 = AM^2 + MB^2$

128. The straight line passes through the point $P(2, \sqrt{3})$ and makes an angle of 60° with the x-axis. The length of the intercept on it between the point P and the line $x + \sqrt{3}y = 12$ is :

- (a) 1.5 (b) 2.5
(c) 3.5 (d) 4.5

129. Let H be a sub-group of a group G and, $b \in H$. Let $a \sim b$ iff $a \equiv b \pmod H$, then which of the following is true ?

- (a) ' \sim ' is a reflexive relation
(b) ' \sim ' is a symmetric relation
(c) ' \sim ' is a transitive relation
(d) All of these

130. Let P be a probability function on $S = (I_1, I_2, I_3, I_4)$ such that $P(I_2) = 1/3$, $P(I_3) = 1/6$, $P(I_4) = 1/9$. Then $P(I_1)$ is :

- (a) $7/18$ (b) $1/3$
(c) $1/6$ (d) $1/2$ A

131. If $U =$ (natural numbers), $A =$ (multiples of 3) and $B =$ (multiples of 5), then $A - B$ equals :

- (a) $\overline{A} \cap B$ (b) $A \cap \overline{B}$
(c) $\overline{A} \cap \overline{B}$ (d) $\overline{A \cap B}$

132. Which of the following statement is true ?

- (a) For any two sets A and B either $A \subseteq B$ or $B \subseteq A$
(b) $\{a\} \in \{a, b, c\}$
(c) $\{a, b, a, b, a, b, \dots\}$ is an infinite set
(d) $\{a, b, c\} = \{c, a, b\}$

133. State which of the following statement is correct ?

- (a) Every set has a proper subset
 (b) Every subset of a finite set is finite
 (c) Every subset of an infinite set is infinite
 (d) The set $\{x : x + 8 = 8\}$ is the null set

134. If the matrices $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 3 \\ 1 & -5 \\ 4 & 1 \end{bmatrix}$, then AB

is equal to :

- (a) $\begin{bmatrix} -3 & -1 \\ -9 & -3 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -1 \\ 9 & -3 \end{bmatrix}$
 (c) $\begin{bmatrix} -3 & 1 \\ 9 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 1 \\ -9 & 3 \end{bmatrix}$ (BHU-2012)

135. If ω is cube root of unity, then the value of determinant

$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}$ is equal to :

- (a) -1 (b) 1 (c) 0 (d) 2

136. The expression $\frac{12}{3 + \sqrt{5} + 2\sqrt{2}}$ is equal to :

- (a) $1 - \sqrt{5} + \sqrt{2} + \sqrt{10}$ (b) $1 - \sqrt{5} - \sqrt{2} + \sqrt{10}$
 (c) $1 + \sqrt{5} - \sqrt{2} + \sqrt{10}$ (d) $1 + \sqrt{5} + \sqrt{2} - \sqrt{10}$

137. If ${}^nC_{r-1} = 36$, ${}^nC_r = 84$ and ${}^nC_{r+1} = 126$, then the value of r is equal to :

- (a) 1 (b) 2
 (c) 3 (d) 4

138. In the binomial expansion of $(a - b)^n$, $n \geq 5$, the sum of 5th and 6th terms is zero. Then a/b equals :

- (a) $\frac{n-5}{6}$ (b) $\frac{n-4}{5}$
 (c) $\frac{5}{n-4}$ (d) $\frac{6}{n-5}$

139. The sum of 16 terms of the following series

$$\frac{1^3}{1} + \frac{1^3 + 2^3}{1+2} + \frac{1^3 + 2^3 + 3^3}{1+2+3} + \dots + 6$$

- (a) 446 (b) 644
 (c) 464 (d) 460

140. If $x = 1 + a + a^2 + a^3 + \dots \infty$ ($a < 1$), $x = 1 + b + b^2 + b^3 + \dots \infty$ ($b < 1$), then the value of $x = 1 + ab + a^2b^2 + a^3b^3 + \dots \infty$ is equal to :

- (a) $\frac{xy}{x+y+1}$ (b) $\frac{xy}{x+y-1}$
 (c) $\frac{x-y}{x+y+1}$ (d) $\frac{x-y}{x+y-1}$

141. If the sum of first p terms of an A. P. is q and the sum of the first q terms is p , then the sum of the first $(p + q)$ terms is : (BHU-2012)

- (a) $p + q + 1$ (b) $-(p + q + 1)$
 (c) $-(p + q)$ (d) $p + q$

142. The n th term of the series $2\frac{1}{2} + 1\frac{7}{13} + 1\frac{1}{9} + \frac{20}{23} + \dots$ is :

- (a) $\frac{20}{5n^2 + 3}$ (b) $20(5n + 3)$
 (c) $\frac{2}{5n - 3}$ (d) $\frac{20}{5n + 3}$ (BHU-2012)

143. The value of $7 \log \frac{16}{15} + 5 \log \frac{25}{24} + 3 \log \frac{81}{80}$ is equal to :

- (a) $\log 2$ (b) zero
 (c) unity (d) 0.2 (BHU-2012)

144. The value of complex number $\left(\frac{1+i}{\sqrt{2}}\right)^8 + \left(\frac{1-i}{\sqrt{2}}\right)^8$ is :

- (a) 2 (b) -2 (c) $\sqrt{2}$ (d) $\frac{1}{\sqrt{2}}$

145. If the sum of three consecutive odd natural numbers is 153, then the numbers are : (BHU-2012)

- (a) 47, 49, 51 (b) 49, 51, 53
 (c) 51, 53, 55 (d) 53, 55, 57

146. The solution of the following equation

$$\frac{x-1}{3} - \frac{4x+1}{4} = \frac{1}{12}$$
 is : (BHU-2012)

- (a) -1 (b) 1 (c) -2 (d) 2

147. The factorization of the expression $36x^2 - 12x + 1 - 25y^2$ is :

- (a) $(5x - 6y + 1)(5x + 6y + 1)$
 (b) $(6x - 5y + 1)(6x + 5y + 1)$
 (c) $(5x - 6y - 1)(5x + 6y - 1)$
 (d) $(6x - 5y - 1)(6x + 5y - 1)$ (BHU-2012)

148. If $\frac{\log x}{b-c} = \frac{\log y}{c-a} = \frac{\log z}{a-b}$, then $x^a y^b z^c$ equals :

- (a) 0 (b) 1 (BHU-2012)
 (c) xyz (d) None of these

149. Which of the following decimal number is in the form p/q ?

- (a) $60/7$ (b) $68/9$
 (c) $63/4$ (d) $62/5$ (BHU-2012)

150. Which of the following is the decimal representation of $22/7$?

- (a) $3.\overline{142857}$ (b) 3.142867
 (c) $3.\overline{142957}$ (d) $3.\overline{142967}$ (BHU-2012)