SURE SUCCESS
INSIGHT MCA CLASSES
Exculsive Coaching Classes for MCA & IIT-JAM Entrance
Regd. No. 1014
INSIGHT MCA CLASSES
By GOPAL AGARWAL
M.Sc. 5 Years (IIT-Kanpur)
9336108560
9936643758
(0512) 3914171
H.O. : 113/3-K Friends Colony, Swaroop Nagar, Kanpur- B.O. :Saket Nagar & Kakadeo, Kanpur

BHU 2013 ORIGINAL

Note : (i) Attempt as many questions as you can. Each question carries 3 marks. One mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question. (i) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

1. The Indian Flag is rectangular in shape and the ratio of the length to breadth is : **(BHU-2013)**

   (a) 2 : 1 (b) 3 : 2 (c) 3 : 4 (d) 5 : 3

2. What is the shape of the earth's orbit around the Sun ? **(BHU-2013)**

   (a) Circular (b) Hyperbolic
   (c) Elliptical (d) Parabolic

3. Which of the following is the author of Song of India ?

   (a) Firdausi (b) Sarojini Naidu
   (c) Lala Lajpat Rai (d) Sri Aurobindo Ghosh

4. The only religious book ever printed in shorthand script is :

   (a) The Ramayana (b) The Mahabharata
   (c) The Bible (d) Guru Granth Sahib

5. The UN (United Nations) came into existence in :

   (a) 1946 (b) 1945 (c) 1947 (d) 1950

6. The word CHEERS is codes as EHCSRE. According to the same rule, the word BASKET is coded as : **(BHU-2013)**

   (a) BSATEK (b) KETBAS
   (c) SABTEK (d) ASBEKT

7. A players holds 13 cards of four suits, of which seven are black and six are red. There are twice as many diamonds as spades and twice as many hearts as diamonds. How many clubs does he hold?

   (a) 4 (b) 5 (c) 6 (d) 7

8. It was Sunday on January 1, 2006. What was the day of the week on January 1, 2010 ? **(BHU-2013)**

   (a) Sunday (b) Saturday
   (c) Friday (d) Wednesday

9. A watch which gains uniformly is 2 minutes low at noon on Monday and is 4 minutes 48 seconds fast at 3 p.m. on the following Monday. When was it correct ? **(BHU-2013)**

   (a) 2 p.m. on Tuesday (b) 2 p.m. on Wednesday
   (c) 3 p.m. on Thursday (d) 1 p.m. on Friday

10. 15 litres of mixture contains 20% alcohol and the rest water. If 3 litres of water is mixed with it, the percentage of alcohol in the new mixture would be

    (a) 15% (b) $16\frac{2}{3}\%$ (c) 17% (d) $18\frac{1}{2}\%$

11. The milk and water in two vessels A and B are in the ratio 4 : 3 and 2 : 3 respectively. In what ratio, the liquids in both the vessels be mixed to obtain a new mixture in vessel C containing half-milk and half- water ? **(BHU-2013)**

    (a) 7 : 5 (b) 7 : 8 (c) 5 : 7 (d) 8 : 7

Directions :

12. A : Some substances are crystalline. Marble is crystalline. Marble is a substance.

    B : All greyhounds are dogs. Some dogs are cows. Some greyhounds are dogs.

    C : All locks are keys. Some keys do not open. Some locks do not open.

    (a) A only (b) B and C (c) A and C (d) N.O.T.

13. A : Many poets are not readers. All strangers are poets. Some singers are not readers.

    B : Boys play cricket. Some girls do not play cricket. Some girls are not boys.

    C : All Eskimos live in Igloos. Some Penguins live in Igloos. Some Penguins live in Igloos. Some Penguins are Eskimos. **(BHU-2013)**

(a) A only (b) B only (c) C only (d) B and C

14. A : Ravens are black. Ravens are evil. All evils are black.

B : Horses are faster than eagles. All eagles are hawks. Horses are faster than hawks.

C : No priest is a saint. Peter is a priest. Peter is a saint. **(BHU-2013)**

(a) A only (b) B only (c) C only (d) N.O.T.

15. A : All beautiful things are sad. She is beautiful. She is sad.

B : All nice things are flat. TVs are flat. TVs are nice things.

C : Potatoes are stems. All stems are fruits. Potatoes are fruits. **(BHU-2013)**

(a) A only (b) A and B (c) C only (d) A and C

16. Statements : All bags are cakes. All lamps are cakes. **(BHU-2013)**

Conclusion : (I) Some lamps are bags.

(II) No lamp is bag.

(a) (I) follows (b) (II) follows

(c) either (I) or (II) follows

(d) Neither (I) nor (II) follow

17. A, B, C and D play a game of cards. A says to B, "If I give you 8 cards, you will have as many as C has and I shall have 3 less than what C has. Also, If I take 6 cards from C, I shall have twice as many as D has". If B and D together have 50 cards, how many cards has C got ? **(BHU-2013)**

(a) 35 (b) 37 (c) 27 (d) 40

18. If the word DISTURBANCE, the first letter is interchanged with the last letter, the second letter is interchanged with the tenth letter and so on, which letter would come after 'T' in the newly formed word ? **(BHU-2013)**

(a) I (b) N (c) S (d) D

19. In a pile of 10 books, there are 3 of History, 3 of Hindi, 2 of Mathematics and 2 of English. Taking from above, there is an English book between a History and Mathematics book, a History book between Mathematics and English book, a Hindi book between an English and A Mathematics book, a Mathematics book between two Hindi books and two Hindi books between a Mathematics and a History book. Book of which subject is at the sixth position from the top ? **(BHU-2013)**

(a) English (b) Hindi

(c) Mathematics (d) History

20. Choose the best alternatives : 21 : 3 : : 574 : ?

(a) 23 (b) 82 (c) 97 (d) 113

(BHU-2013)

21. Identify the wrong number in the series :

(a) 5 (b) 13 (c) 26 (d) 55

22. A and B undertake to do a piece of work for Rs. 600. A alone can do it in 6 days while B alone can do it in 8 days. With the help of C, they finish it in 3 days. Then the share of A is : **(BHU-2013)**

(a) Rs 250 (b) Rs 75 (c) Rs 300 (d) Rs 225

23. Let N be the largest number which divides 1305, 4665 and 6905 to leave the same remainder in each case. Then sum of the digits in N is : **(BHU-2013)**

(a) 4 (b) 5 (c) 6 (d) 8

24. Ajay plans to drive from city A to station C, at the speed of 70 km per hour, to catch a train arriving there from B. He must reach C at least 15 minutes before the arrival of the train. The train leaves B, located 500 km South of A, at 8 : 00 AM and travels at a speed of 50 km per hour. It is known that C is located between West and North-West of B, with BC at 60^o to AB. Also, C is located between South and South-West of A with AC at 30^o to AB. The latest time by which Ajay must leave A and still catch the train is closest to : **(BHU-2013)**

(a) 6 : 15 AM (b) 6 : 30 AM

(c) 6 : 45 AM (d) 7 : 00 AM

25. The sum of

$$\sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}}+\sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}}+.....\sqrt{1+\frac{1}{(2007)^2}+\frac{1}{(2008)^2}} \text{ is}$$

(a) $2008-\frac{1}{2008}$ (b) $2007-\frac{1}{2007}$

(c) $2007-\frac{1}{2008}$ (d) $2008-\frac{1}{2007}$

26. The number of common terms in the two sequences 17, 21, 25, ..., 417 and 16, 21, 26, ..., 466 is :

(a) 78 (b) 19 (c) 20 (d) 77

27. The integers 1, 2, ..., 40 are written on a blackboard.

The following operation is then repeated 39 times. In each repetition, any two numbers, say a and b, currently on the blackboard are erased and a new number a + b - 1 is written. What will be the number left on the board at the end ?

(a) 820 (b) 821 (c) 781 (d) 819

28. A shop stores x kg of rice. The first customer buys half of this amount plus half a kg of rice. The second customer buys half the remaining amount plus half a kg of rice. Then the third customer also buys half the remaining amount plus half a kg of rice. Thereafter, no rice is left in the shop. Which of the following best describes the value of x ?

(a) $2 \le x \le 6$ (b) $5 \le x \le 8$

(c) $9 \le x \le 12$ (d) $11 \le x \le 14$

29. ABCD is a parallelogram with $\angle ABC = 60^o$. If the longer diagonal is of legth 7 cm and the area of the parallelogram ABCD is $15\frac{\sqrt{3}}{2}$ sq. cm., then the perimeter of the parallelogram (in cm) is :

(a) 16 (b) $15\sqrt{3}$ (c) 15 (d) $16\sqrt{3}$

30. Books and More, sells books, music CD's and film DVD's. In December, 2004, they earned 40% profit in music CD's and 25% profit in books. Music CD's contributed 35% towards their total sales in rupees. At the same time total sales in rupees from books is 50% more than that of music CD's. If Books and More made 50% loss in film DVD's, then overall they made **(BHU-2013)**

(a) 12.3% profit (b) 8.7% profit

(c) 0.4% loss (d) 6.25% loss

31. Kunal walks 10 km towards North. From there, he walks 6 km towards South. Then he walks 4 km towards East. How far and in which direction is he with reference to his starting point ?

(a) 5 km, West (b) 5 km, North-East

(c) 7 km, East (d) 7 km, West

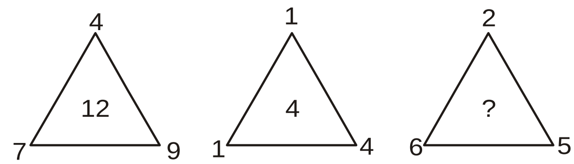
32. If X is the brother of the son of Y's son, how is x related to Y ?

(a) Son (b) Brother (c) Cousin (d) Grandson

33. Four digits of number 29138576 are omitted so that the result is as large as possible. The largest omitted digit is : **(BHU-2013)**

(a) 9 (b) 8 (c) 6 (d) 5

34. Which number replace the question mark ?



(a) 7 (b) 3 (c) 13 (d) 9

35. a, b, c, d and e are integers such that $1 \le a < b < c < d < e$. If a, b, c, d and e are geometric progression and 1cm (m, n) is the least common multiple of m and n, then the maximum value of

$$\frac{1}{1cm(a,b)} + \frac{1}{1cm(b,c)} + \frac{1}{1cm(c,d)} + \frac{1}{1cm(d,e)} \text{ is}$$

(a) 1 (b) $\frac{79}{81}$ (c) $\frac{15}{16}$ (d) $\frac{7}{8}$

36. Which will you call something that is not logical ?

(a) Dislogical (b) Illogical

(c) Nonlogical (d) Unlogical

37. Fill in the blanks : I went ther --------- the midnight.

(a) in (b) during (c) at (d) between

38. Fill in the blanks :

A ---- of hounds chased away the ---- of elephants.

(a) herd, pack (b) pack, herd

(c) group, team (d) team, group

39. Fill in the blanks :

I have warned you. Haven't --------- ?

(a) I (b) you (c) warn (d) warned

40. Fill in the blanks :

You visited London last week. -------- you ?

(a) Do (b) Did (c) Don't (d) Didn't

41. Which of the following sets contains an invalid library function ?

(a) isalnum, abs, strcat (b) isalpha, fmod, strdup

(c) isdigit, modf, strrev (d) isnum, pow, strupr

42. A Central Processing Unit (CPU) consists of

(a) Input, output unit (b) memory unit

(c) arithmetic, and logical unit, central unit

(d) keyboard, printer

43. What will be the output of the following 'C'

program?

```
main (    )
{int x ;
scanf("%d",&x);
if((x)&&(!x))
printf("%s",Hello");
if((x)||(!x))
printf("%s","World");
}
```

(a) Hello (b) World

(c) Hellow World (d) Depends on value of x

44. What will be the output of the followin 'C' program?

```
main ( )
{int x = 1 ;
switch(x)
        {case 0 : printf("%d",&x);
        case 1 : printf("%d",&x);
        case 2 : printf("%d",&x);
        default : printf("%d",&x);
        }
}
```

(a)1 (b) 11 (c) 111 (d) 1111

45. The 'C' programming language can be used to implement

(a) application software only

(b) system software only

(c) both application software and system software

(d) neither application software nor system software

46. In hexadecimal arithmetic, FACE - BAD =

(a) EC21 (b) ED21 (c) EE21 (d) EF21

47. Convert binary 101.101 to decimal

(a) 5.125 (b) 5.375 (c) 5.625 (d) 5.875

48. Convert decimal 50.75 to binary

(a) 110010.01 (b) 110010.11

(c) 110100.01 (d) 110100.11

49. What is the width of a 15-inch monitor with a 4 : 3 aspect ratio ?

(a) 12 inches (b) 13 inches

(c) 14 inches (d) 15 inches

50. Thin film transistor liquid crystal display is an example of

(a) input device (b) processor

(c) memory device (d) output device

51. An object weighs 100 N on earth's surface. How much will it weigh when moved to a point one earth radius above the earth's surface ?

(a) 25 N (b) 50 N (c) 200 N (d) 400 N

52. If we travel from the north pole to the south pole, the value of g will :

(a) increase (b) decrease

(c) increase till the equator and then decrease

(d) decrease till the equator and then increase

53. When a particle moves with constant speed along a circle

(a) its velocity remains constant

(b) no force act on it

(c) no acceleration is produced on it

(d) no work is done on it

54. A 2000 kg car travels at a constant speed of 12 m /s around a circular curve of radius 30 m. What is the magnitude of the centripetal acceleration of the car as it goes around the curve?

(a) 2.5 m/s^2 (b) 4.8 m/s^2

(c) 8.33 m/s^2 (d) 9.6 m/s^2

55. A shell is fired from a cannon and it explodes in the air, then

(a) neither its momentum nor its kinetic energy increase

(b) only its momentum increases

(c) only its kinetic energy increases

(d) Both its momentum and kinetic energy increase

56. If the momentum of a particle is increased by 50%, then its kinetic energy increases by

(a) 25% (b) 125% (c) 225% (d) 625%

57. A particle of mass m has momentum p. What is its kinetic energy ?

(a) $\frac{p^2}{2m}$ (b) $\frac{p^2}{4m}$ (c) $\frac{2p^2}{m}$ (d) $\frac{4p^2}{m}$

58. A particle of mass m moving with a velocity ν

strikes a stationary particle of mass 4m and sticks to it. The speed of the system will be :

(a) $\frac{\nu}{4}$ (b) $\frac{\nu}{5}$ (c) 4ν (d) 5ν

59. Which of the following is not valid ?

(a) Inertia of rest (b) Inertia of motion

(c) Inertia of directio (d) Inertia of kinetic energy

60. A beam balance measures ------ and a spring balance measures------.

(a) weight, weight (b) weight, mass

(c) mass, weight (d) mass, mass

61. The number of solutions of the pair of equations

$$2\sin^2\theta - \cos 2\theta = 0$$
$$2\cos^2\theta - 3\sin\theta = 0$$

in the interval [0, 2π] is : **(BHU-2013)**

(a) zero (b) one (c) two (d) four

62. The number of distinct real values of λ, for which the vectors $-\lambda^2\hat{i}+\hat{j}+\hat{k}$, $\hat{i}-\lambda^2\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}-\lambda^2\hat{k}$ are coplanar is :

(a) zero (b) one (c) two (d) three

63. One Indian and four American men and their wives are to be seated randomly around a circular table. Then the conditional probability that the Indian man is seated adjacent to his wife given that each American man is seated adjacent to his wife is :

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{5}$ (d) $\frac{1}{5}$ D**(BHU-2013)**

64. Let f (x) be differentiable on the interval $(0,\infty)$ such that f (1) = 1, and $\lim\limits_{t\to x}\frac{t^2f(x)-x^2f(t)}{t-x}=1$ for each x > 0. Then f(x) is :**B(BHU-2013)**

(a) $\frac{1}{3x}+\frac{2x^2}{3}$ (b) $\frac{-1}{3x}+\frac{4x^2}{3}$

(c) $\frac{-1}{x}+\frac{2}{x^2}$ (d) $\frac{1}{x}$

65. If $\lim\limits_{x\to 0}[1+x\ln(l+b^2)]^{\frac{1}{x}}=2b\sin^2\theta$, b > 0 and $\theta\in(-\pi,\pi)$ then the value of θ is : **D(BHU-2013)**

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

66. Let $\omega\neq 1$ be a cube root of unity and S be the set of all non-singular matrices of the form

$$\begin{bmatrix} 1 & a & b \\ \omega & 1 & c \\ \omega^2 & \omega & 1 \end{bmatrix}$$

where each of a,b and c is either ω or ω^2. Then the number of distinct matrices in the set S is :**(BHU-2013)**

(a) 2 (b) 6 (c) 4 (d) 8 C

67. Let $P=\{\theta:\sin\theta-\cos\theta=\sqrt{2}\cos\theta\}$ and $Q=\{\theta:\sin\theta+\cos\theta=\sqrt{2}\sin\theta\}$ be two sets. Then:

(a) $P\subset Q$ and $Q-P=\phi$ (b) $Q\not\subset P$

(c) $P\not\subset Q$ (d) P = Q D**(BHU-2013)**

68. Let the straight line x = b divide the area enclosed by $y=(1-x)^2$, y = 0 and x = 0 into two parts $R_1(0\le x\le b)$ and $R_2(b\le x\le 1)$ such that $R_1-R_2=\frac{1}{4}$. Then b equals : **(BHU-2013)**

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{4}$ B

69. Let $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=\hat{i}-\hat{j}+\hat{k}$ and $\vec{c}=\hat{i}-\hat{j}-\hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$, whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$, is given by

(a) $\hat{i}-3\hat{j}+3\hat{k}$ (b) $-3\hat{i}-3\hat{j}-\hat{k}$

(c) $3\hat{i}-\hat{j}+3\hat{k}$ (d) $\hat{i}+3\hat{j}-3\hat{k}$

70. One ticket is selected at random from 50 tickets numbered 00, 01, 02, ...,49. Then the probability that the sum of the digits on the selected ticket is 8, given that the product of these digits is zero, equals:

(a) $\frac{1}{14}$ (b) $\frac{1}{7}$ (c) $\frac{5}{14}$ (d) $\frac{1}{50}$ A**(BHU-2013)**

71. The ellipse $x^2+4y^2=4$ is inscribed in a rectangle aligned with the coordinate axes, which in turn is inscribed in another ellipse that passes through the point (4, 0), then the equation of the ellipse is : **(BHU-2013)**

(a) $x^2+16y^2=16$ (b) $x^2+12y^2=16$

(c) $4x^2+48y^2=48$ (d) $4x^2+64y^2=48$ B

72. If $\left|z-\frac{4}{z}\right|=2$, then the maximum value of | Z | is equal to **B (BHU-2013)**

(a) $\sqrt{3}+1$ (b) $\sqrt{5}+1$ (c) 2 (d) $\left(2+\sqrt{2}\right)$

73. In a binomial distribution **A(BHU-2013)**

$$B\left(n,p=\frac{1}{4}\right)$$

if the probability of at least one success is greater than or equal to $\frac{9}{10}$, then n is greater than :

(a) $\frac{1}{\log_{10}4-\log_{10}3}$ (b) $\frac{1}{\log_{10}4+\log_{10}3}$

(c) $\frac{9}{\log_{10}4-\log_{10}3}$ (d) $\frac{4}{\log_{10}4-\log_{10}3}$

74. For real x, let $f(x)=x^2+5x+1$, then

(a)f is one-one but not onto R

(b)f is onto R but not-one

(c)f is one-one and onto R

(d)f is neither one-one nor onto R **D(BHU-2013)**

75. If $f(x)=\cos([\pi]x)+\cos[\pi x]$ then $f\left(\frac{\pi}{2}\right)$ is :

(a)0 (b) cos 3 (c) cos 4 (d)1+cos4

C(BHU-2013)

76. If A, B and C are three sets such that $A\cap B=A\cap C$ and $A\cup B=A\cup C$, then

(a) A = B (b) A = C (c) B = C

(d) $A\cap B=\phi$ C**(BHU-2013)**

77. Let A be a square matrix all of whose entries are integers. Then, which one of the following is true?

(a) If det (A) = ± 1, then A^{-1} exist but all its entries are not necessarily integers

(b) If det (A) $\neq$ ± 1, then A^{-1}exist and all its entries are non-integers

(c) If det (A) = ± 1, then A^{-1} exist and all its entries are integers

(d) If det (A) = ± 1, then A^{-1} need not exist **A**

78. The value of $\sqrt{2}\int\frac{\sin x\,dx}{\sin\left(x-\frac{\pi}{4}\right)}$ is : **(BHU-2013)**

(a) $x+\log\left|\cos\left(x-\frac{\pi}{4}\right)\right|+c$

(b) $x-\log\left|\cos\left(x-\frac{\pi}{4}\right)\right|+c$

(c) $x+\log\left|\sin\left(x-\frac{\pi}{4}\right)\right|+c$

(d) $x-\log\left|\cos\left(x-\frac{\pi}{4}\right)\right|+c$ **C**

79. The conjugate of a complex number is $\frac{1}{i-1}$. Then, that complex number is C (a) $-\frac{1}{i-1}$ (b) $\frac{1}{i+1}$ (c) $-\frac{1}{i+1}$ (d) $\frac{1}{i-1}$

80. A die is thrown. Let A be the event that the number obtained is greater than 3. Let B be the event that the number obtained is less than 5. Then $P(A\cup B)$ is : **C(BHU-2013)**

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

81. If the difference between the roots of the equation $x^2 + ax + 1 = 0$ is less than $\sqrt{5}$, then the set of possible values of α is A

(a) (-3,3) (b) (-3, ∞) (c) (3, ∞) (d) (-∞,-3)

82. The area enclosed between the curves $y^2=x$ and $y=|x|$ is : C **(BHU-2013)**

(a) $\frac{2}{3}$ (b) 1 (c) $\frac{1}{6}$ (d) $\frac{1}{3}$

83. Let $F(x) = f(x) + f\left(\frac{1}{x}\right)$ where

$f(x) = \int_1^x \frac{\log t}{1+t} dt$. Then F(e) equals :

(a) $\frac{1}{2}$ (b) 0 (c) 1 (d) 2 **C(BHU-2013)**

84. The average marks of boys in a class is 52 and that of girls is 42. The average marks of boys and girla combined is 50. The percentage of boys in the class is : **C(BHU-2013)**

(a) 40 (b) 20 (c) 80 (d) 60

85. The function $f(x) = \tan^{-1}(\sin x + \cos x)$ is an increasing function in : **B(BHU-2013)**

(a) $\left(\frac{\pi}{4}, \frac{\pi}{2}\right)$ (b) $\left(-\frac{\pi}{2}, \frac{\pi}{4}\right)$

(c) $\left(0, \frac{\pi}{2}\right)$ (d) $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

86. A value of C for which the conclusion of mean value theorem holds for the function $f(x) = \log_e x$ of the interval [1, 3] is : **A(BHU-2013)**

(a) $2\log_3 e$ (b) $\frac{1}{2}\log_e 3$ (c) $\log_3 e$ (d) $\log_e 3$

87. For the hyperbola

$$\frac{x^2}{\cos^2\alpha} - \frac{y^2}{\sin^2\alpha} = 1$$

which of the following remains constant when α varies ?

(a) Eccentricity (b) Directrix

(c) Abscissae of vertices (d) Abscissae of foci

88. If $|Z + 4| \le 3$, then the maximum value of $|z + 1|$ is

(a) 4 (b) 10 (c) 6 (d) 0 C

89. A pair of fair dice is thrown independently three times. The probability of getting a score of exactly 9 twice is : **D(BHU-2013)**

(a) $\frac{1}{729}$ (b) $\frac{8}{9}$ (c) $\frac{8}{729}$ (d) $\frac{8}{243}$

90. A body weighing 13 kg is suspended by two strings 5 m and 12 m long, their other ends being fastened to the extremities of a rod 13 m long. If the rod be so held that the body hangs immediately below the middle point. The tensions in the strings are :

(a) 12 kg and 13 kg (b) 5 kg and 5 kg

(c) 5 kg and 12 kg (d) 5 kg and 13 kg

91. The resultant R of two forces acting on a particle is at right angles to one of them and its magnitude is one-third of the other force. The ratio of larger force to smaller one is : **(BHU-2013)**

(a) 2 : 1 (b) $3:\sqrt{2}$ (c) 3 : 2 (d) $3:2\sqrt{2}$

92. A lizard, at an initial distance of 21 cm behind an insect, moves from rest with an acceleration of 2 cm/s^2 and pursues the insect which is crawling uniformly along a straight line at a speed of 20 cm/s. Then the lizard will catch the insect after

(a) 20 s (b) 1 s (c) 21 s (d) 24 s

93. Let A and B be two events such that

$$P\left(\overline{A \cup B}\right) = \frac{1}{6},\ P\left(A \cap B\right) = \frac{1}{4} \text{ and } P(\bar{A}) = \frac{1}{4}$$

where $\bar{A}$ stands for complement of event A. Then events A and B are **C(BHU-2013)**

(a) equally likely and mutually exclusive

(b) equally likely but not independent

(c) independent but not equally likely

(d) mutually exclusive and independent

94. For any vector $\vec{a}$, the value of $(\vec{a} \times \hat{i})^2 + (\vec{a} \times \hat{j})^2 + (\vec{a} \times \hat{k})^2$ is equal to :

(a) $3\vec{a}^2$ (b) $\vec{a}^2$ (c) $2\vec{a}^2$ (d) $4\vec{a}^2$

95. The distance between the line $\vec{r} = 2\hat{i} - 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - \hat{j} + 4\hat{k})$ and the plane $\vec{r}.(\hat{i} + 5\hat{j} + \hat{k}) = 5$ is : **BHU-2013**

(a) $\frac{10}{9}$ (b) $\frac{10}{3\sqrt{3}}$ (c) $\frac{3}{10}$ (d) $\frac{10}{3}$

96. The locus of a point P (α, β) moving under the condition that the line $y = \alpha x + \beta$ is a tangent to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is : **BHU-2013**

(a)an ellipse (b) a circle
(c) a parabola (d) a hyperbola D

97. If $x\frac{dy}{dx} = y(\log y - \log x + 1)$ then the solution of the equation is : **C(BHU-2013)**

(a) $y\log\left(\frac{x}{y}\right) = cx$ (b) $x\log\left(\frac{y}{x}\right) = cy$

(c) $\log\left(\frac{y}{x}\right) = cx$ (d) $\log\left(\frac{x}{y}\right) = cy$

98. If f is a real-valued differentiable function satisfying $|f(x) - f(y)| \le (x-y)^2$, $x, y \in R$ and f(0) = 0, then f(1) equals : B **(BHU-2013)**
(a)-1 (b) 0 (c) 2 (d) 1

99. Let α and β be the distinct roots of $ax^2 + bx + c = 0$, then $\lim_{x\to\alpha} \frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$ is equal to : A **(BHU-2013)**

(a) $\frac{a^2}{2}(\alpha-\beta)^2$ (b) 0

(c) $-\frac{a^2}{2}(\alpha-\beta)^2$ (d) $\frac{1}{2}(\alpha-\beta)^2$

100. The normal to the curve x = a(cosθ + θ sinθ), y = a(sinθ - θcosθ) at any point θ is such that :
(a)it passes through the origin

(b)it makes angle $\frac{\pi}{2} + \theta$ with x-axis

(c)it passes through $\left(a\frac{\pi}{2}, -a\right)$ **D(BHU-2013)**

(d)it is a constant distance from the origin

101. If Z_1 and Z_2 are two non-zero complex number such that $|Z_1 + Z_2| = |Z_1| + |Z_2|$, then arg Z_1 - arg Z_2 is equal to C**(BHU-2013)**

(a) $\frac{\pi}{2}$ (b) $-\pi$ (c) 0 (d) $-\frac{\pi}{2}$

102. The system of equation ax + y + z = $\alpha - 1$, x + ay + z = $\alpha - 1$, x + y + az = $\alpha - 1$ has no solution, if α is A **(BHU-2013)**
(a) -2 (b) either -2 or 1 (c) not -2 (d) 1

103. If in a frequency distribution, the mean and median are 21 and 22 respectively, then its mode is approximately : **D(BHU-2013)**
(a) 22.0 (b) 20.5 (c) 25.5 (d) 24.0

104. $\lim_{n\to\infty}\left[\frac{1}{n^2}\sec^2\frac{1}{n^2} + \frac{2}{n^2}\sec^2\frac{4}{n^2} + ... + \frac{1}{n^2}\sec^2 1\right]$ equals D **(BHU-2013)**

(a) $\frac{1}{2}$ sec 1 (b) $\frac{1}{2}$ cosec 1 (c) tan 1 (d) $\frac{1}{2}$ tan 1

105. Area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is **BHU-2013**

(a)2ab (b) ab (c) $\sqrt{ab}$ (d) $\frac{a}{b}$ A

106. A die is tossed 5 times. Getting an odd number is considered a success. The the variance of distribution of success is :D **(BHU-2013)**

(a) $\frac{8}{3}$ (b) $\frac{3}{8}$ (c) $\frac{4}{5}$ (d) $\frac{5}{4}$

107. A and B are events such that

$$P(A \cup B) = \frac{3}{4}, (A \cap B) = \frac{1}{4}, P(\bar{A}) = \frac{2}{3}$$

then $P(\bar{A} \cap B)$ is :A **(BHU-2013)**

(a) $\frac{5}{12}$ (b) $\frac{3}{8}$ (c) $\frac{4}{5}$ (d) $\frac{5}{4}$

108. $1^3 - 2^3 + 3^3 - 4^3 + ... + 9^3$ = A
(a) 425 (b) -425 (c) 475 (d) 475

109. The value of $2^{1/4} . 4^{1/8} . 8^{1/6} + ... \infty$ is
(a) 1 (b) 2 (c) 3/2 (d) 4

110. The domain of $\sin^{-1}\left[\log_3\left(\frac{x}{3}\right)\right]$ is : **A(BHU-2013)**
(a)[1, 9] (b) [-1, 9] (c) [-9, 1] (d) [-9, -1]

111. A problem in Mathematics is given to three students A, B, C and their respective probability of solving the problem is $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$. Probability that the problem is solved is :A **(BHU-2013)**

(a) $\frac{3}{4}$ (b) $\frac{1}{2}$ (c) $\frac{2}{3}$ (d) $\frac{1}{3}$

112. If the sum of first n terms of an A.P. is cn^2 then the sum of square of these n terms is C **(BHU-2013)**

(a) $\frac{n(4n^2-1)c^2}{6}$ (b) $\frac{n(4n^2+1)c^2}{3}$

(c) $\frac{n(4n^2-1)c^2}{3}$ (d) $\frac{n(4n^2+1)c^2}{6}$

113. Let z = cos θ + i sin θ. Then the value of

$\sum_{m=1}^{16} \mathrm{Im}(z^{2m-1})$ at $\theta = 2^o$ is **:(BHU-2013)**

(a) $\frac{1}{\sin 2^o}$ (b) $\frac{1}{3\sin 2^o}$ (c) $\frac{1}{2\sin 2^o}$ (d) $\frac{1}{4\sin 2^o}$

114. Let A, B, C be three sets of complex numbers as defined below **C(BHU-2013)**

$$A = \{z : \mathrm{Im}\, z \geq 1\}$$

$$B = \{z : |z-2-i| = 3\}$$

$$C = \{z : \mathrm{Re}((1-i)z) = \sqrt{2}\}$$

Let z be any point in $A \cap B \cap C$. Then, $|z+1-i|^2 + |z-5-i|^2$ lies betwee :

(a) 25 and 29 (b) 30 and 34

(c) 35 and 39 (d) 40 and 44

115. Let A, B, C be three sets of complex numbers as defined below **B(BHU-2013)**

$$A = \{z : \mathrm{Im}\, z \geq 1\}$$

$$B = \{z : |z-2-i| = 3\}$$

$$C = \{z : \mathrm{Re}((1-i)z) = \sqrt{2}\}$$

(a) 0 (b) 1 (c) 2 (d) ∞

116. Consider the functions defined implicitly by the equation $y^3 - 3y + x = 0$ on various intervals in the real line. If $x \in (-\infty, -2) \cup (2, \infty)$, the equation implicitly defines a unique real valued differentiable function y = f(x). If $x \in (-2, 2)$, the equation implicitly defines a unique real valued differentiable function y = g(x) satisfying g(0) = 0. If $f(-10\sqrt{2}) = 2\sqrt{2}$, then $f''(-10\sqrt{2}) =$ B **(BHU-2013)**

(a) $\frac{4\sqrt{2}}{7^3 2^2}$ (b) $-\frac{4\sqrt{2}}{7^3 3^2}$ (c) $\frac{4\sqrt{2}}{7^3 3}$ (d) $-\frac{4\sqrt{2}}{7^3 3}$

117. A circle of C of radius 1 is inscribed in an equilateral triangle PQR. The points of contact of C with the sides PQ, QR, RP are D, E, F, respectively. The line PQ is given by the equation $\sqrt{3}x + y - 6 = 0$ and the point D is $\left(\frac{3\sqrt{3}}{2}, \frac{3}{2}\right)$. Further, it is given that the origin and the centre of C are on the same side of the line PQ. Equations of the sides QR, RP are : **BHU-2013**D

(a) $y = \frac{2}{\sqrt{3}}x + 1, y = -\frac{2}{\sqrt{3}}x - 1$

(b) $y = \frac{1}{\sqrt{3}}x, y = 0$

(c) $y = \frac{\sqrt{3}}{2}x + 1, y = -\frac{\sqrt{3}}{2}x - 1$

(d) $y = \sqrt{3}x, y = 0$

118. Consider the system of equations

$$ax + by = 0, cx + dy = 0$$

where a, b, c, d $\in$ (0, 1).

Statement-1 : The probability that the system of equations has a unique solution is 3/8.

Statement-2 : The probability that the system of equations has a solution is 1.

Which of the following is correct ?

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement1

(b) Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1 **B(BHU-2013)**

(c) Statement-1 is true, Statement-2 is False

(d) Statement-1 is False, Statement-2 is True

119. Consider three planes

P_1 : x - y + z =1

$P_2 : x + y - z = -1$

$P_3 : x - 3y + 3z = 2$

Let L_1, L_2, L_3 be the lines of intersection of the planes P_2 and P_3, P_3 and P_1, and P_1 and P_2 respectively.

Statement-1 : At least two of the lines L_1, L_2 and L_3 are non-parallel.

Statement-2 : The three planes do not have a common point.

Which of the followin is correct ?

(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement1

(b) Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement - 1

(c) Statement - 1 is True, Statement - 2 is False

(d) Statement - 1 is False, Statement-2 is True

120. If 0 < x < 1, then **(BHU-2013)**

$$\sqrt{1+x^2}[\{x\cos(\cot^{-1}x)+\sin(\cot^{-1}x)\}^2-]^{\frac{1}{2}}$$

(a) $\frac{x}{\sqrt{1+x^2}}$ (b) x (c) $x\sqrt{1+x^2}$ (d) $\sqrt{1+x^2}$

121. Consider the two curves

$C_1 : y^2 = 4x$

$C_2 : x^2 + y^2 - 6x + 1 = 0$

then : **(BHU-2013)**

(a) C_1 and C_2 touch each other only at one point

(b) C_1 and C_2 touch each other exactly at two points

(c) C_1 and C_2 intersect (but do not touch) at exactly two points

(d) C_1 and C_2 neither intersect not touch each other

122. If t_1 and t_2 are the times of flight of two particles having the same initial velocity u and range R on the horizontal, then $t_1^2 + t_2^2$ is equal to :

(a) $\frac{u^2}{g}$ (b) $\frac{4u^2}{g^2}$ (c) $\frac{u^2}{2g}$ (d)1

123. A particle moves towards east from a point A to a point B at the rate of 4 km/h and then towards north from B to C at rate of 5 km/h. If AB = 12 km and BC = 5 km, then its average speed for its journey from A to C and resultant average velocity direct from A to C are respectively :

(a) $\frac{17}{4}$ km / h and $\frac{13}{4}$ km / h

(b) $\frac{13}{4}$ km / h and $\frac{17}{4}$ km / h

(c) $\frac{17}{9}$ km / h and $\frac{13}{9}$ km / h

(d) $\frac{13}{9}$ km / h and $\frac{17}{9}$ km / h

124. A random variable X has the probability distribution

X	1	2	3	4	5	6	7	8
P(x)	0.15	0.3	0.12	0.10	0.20	0.08	0.07	0.05

For the events E = {X is a prime number} and F = {X < 4}, the probability $P(E \cup F)$ is :

(a) 0.87 (b) 0.77 (c) 0.35 (d) 0.50 B**(BHU-2013)**

125. The probability that A speaks truth is 4/5 while this probability for B is 3/4. The probability that they contradict each other when asked to speak on a fact is : **C(BHU-2013)**

(a) $\frac{3}{20}$ (b) $\frac{1}{5}$ (c) $\frac{7}{20}$ (d) $\frac{4}{5}$

126. A particle is acted upon by constant forces $4\hat{i}+\hat{j}-3\hat{k}$ and $3\hat{i}+\hat{j}-\hat{k}$ which displace it from a point $\hat{i}+2\hat{j}+3\hat{k}$ to the point $5\hat{i}+4\hat{j}+\hat{k}$. The work done in standard units by the forces is given by :

(a) 40 (b) 30 (c) 25 (d) 15

127. The normal to the curve x = a(1 + cos θ), y = asinθ at θ always passes through the fixed point :

(a) (a, 0) (b) (0, a) (c) (0, 0) (d) (a, a)

128. Inverse function of $\frac{1-x}{1+x}$ is : B **(BHU-2013)**

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

129. If $\lim_{n\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}\right)^{2x}=e^2$ then the values of a and b are : B**(BHU-2013)**

(a) $a\in R,\ b\in R$ (b) $a=1,\ b\in R$

(c) $a\in R,\ b=2$ (d) a = 1, b = 2

130. Domain of the function ${}^{16-x}C_{2x-1}+{}^{20-3x}C_{4x-5}$ is:

(a) {2,3} (b) {2,3,4} (c) {1,2,3,4} (d) {1,2,3,4,5}

A (BHU-2013)

131. If

$u=\sqrt{a^2\cos^2\theta+b^2\sin^2\theta}+\sqrt{a^2\sin^2\theta+b^2\cos^2\theta}$

then the difference between the maximum and minimum values of u^2 is given by : **(BHU-2013)**

(a) $2(a^2+b^2)$ (b) $2\sqrt{a^2+b^2}$

(c) $(a+b)^2$ (d) $(a-b)^2$

132. If $a_1,a_2,...,a_n,...$ are in G.P., then the value of the determinant $\begin{vmatrix}\log a_n & \log a_{n+1} & \log a_{n+2}\\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5}\\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8}\end{vmatrix}$ is A

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

133. If $a_1,a_2,...,a_n$ are in H.P., then the expression $a_1a_2 + a_2a_3 + ... + a_{n-1}a_n$ is equal to D

(a) n $(a_1 - a_n)$ (b) (n - 1)$(a_1 - a_n)$

(c) na_1a_n (d) (n - 1) a_1a_n

134. If $z^2 + z + 1 = 0$, where z is a complex number, then the value of D**(BHU-2013)**

$$\left(z+\frac{1}{z}\right)^2+\left(z^2+\frac{1}{z^2}\right)^2+\left(z^3+\frac{1}{z^3}\right)^2+...+\left(z^6+\frac{1}{z^6}\right)^2$$

(a) 18 (b) 54 (c) 6 (d) 12

135. The value of $\int_1^a [x]f'(x)dx,\ a>1$ where [x] denotes the greatest integer not exceeding x is :

(a) af(a) - {f(1) + f(2) + ...f([a])}

(b)[a]f(a) - {f(1) + f(2) + ...f([a])}

(c)[a]f([a]) - {f(1) + f(2) + ...f(a)}

(d)af([a]) - {f(1) + f(2) + ...f(a)} **B (BHU-2013)**

136. At an election, a vector may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are of be elected. If a voter votes for at least one candidate, then the number of ways in which he can vote is :
(a) 5040 (b) 6210 (c) 385 (d) 1110 **C(BHU-2013)**

137. The set of points, where $f(x)=\frac{x}{1+|x|}$ is differentiable, is : **C (BHU-2013)**

(a) $(-\infty,0)\cup(0,\infty)$ (b) $(-\infty,-1)\cup(-1,\infty)$

(c) $(-\infty,\infty)$ (d) $(0,\infty)$

138. Let $a_1,a_2,a_3,...$ be terms of an A.P. if $\frac{a_1+a_2+...+a_p}{a_1+a_2+...+a_q}=\frac{p^2}{q^2},p\neq 1$ then $\frac{a_6}{a_{21}}=$ D

(a) 41/11 (b) 7/2 (c) 2/7 (d) 11/41

139. The function $f(x)=\frac{x}{2}+\frac{2}{x}$ has a local minimum at : **A(BHU-2013)**

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

140. Let $A=\begin{pmatrix}1 & 2\\ 3 & 4\end{pmatrix}$ and $B=\begin{pmatrix}a & 0\\ 0 & b\end{pmatrix}$, a, $b\in N$. Then:

(a) there cannot exist any B such that AB = BA

(b) there exist more than one but finite number of B's such that AB = BA

(c) there exists exactly one B such that AB = BA

(d) there exist infinitely many B's such that AB = BA **(BHU-2013)**

141. If x is real, the maximum value of $\frac{3x^2+9x+17}{3x^2+9x+7}$ is : **D(17/7) (BHU-2013)**

(a)1/4 (b) 41 (c) 1 (d) 17/7

142. The values of a, for which the points A, B, C with position vector $2\hat{i}-\hat{j}+\hat{k}$, $\hat{i}-3\hat{j}-5\hat{k}$ and $a\hat{i}-3\hat{j}+\hat{k}$ respectively are the vertices of a right-

angled triangle with $C=\frac{\pi}{2}$ are : **(BHU-2013)**

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

143. $\int_0^{\pi} xf(\sin x)dx$ is equal to : **D(BHU-2013)**

(a) $\pi\int_0^{\pi} f(\cos x)dx$ (b) $\pi\int_0^{\pi} f(\sin x)dx$

(c) $\frac{\pi}{2}\int_0^{\frac{\pi}{2}} f(\sin x)dx$ (d) $\pi\int_0^{\frac{\pi}{2}} f(\cos x)dx$

144. At a telephone enquiry system the number of phone calls regarding relevant enquiry follows Poisson distribution with an average of 5 phone calls during 10-minute time intervals. The probability that there is at the most one phone call during a 10-minute time period is : **D(BHU-2013)**

(a) $\frac{6}{5^e}$ (b) $\frac{5}{6}$ (c) $\frac{6}{55}$ (d) $\frac{6}{e^5}$

145. The value of $\sum_{k=1}^{10}\left(\sin\frac{2k\pi}{11}+i\cos\frac{2k\pi}{11}\right)$ is C

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

146. If A and B are square matrices of size n × n such that $A^2-B^2=(A-B)(A+B)$, then which of the following will be always true ? **(BHU-2013)**

(a) A = B (b) AB = BA

(c) Either of A or B is a zero matrix

(d) Either of A or B is an identity matrix

147. If $(\bar{a}\times\bar{b})\times\bar{c}=\bar{a}\times(\bar{b}\times\bar{c})$, where $\bar{a},\bar{b}$ and $\bar{c}$ are any three vectors such that $\bar{a}.\bar{b}\neq 0,\ \bar{b}.\bar{c}\neq 0$, then $\bar{a}$ and $\bar{c}$ are : **(BHU-2013)**

(a) inclined at an angle of $\frac{\pi}{3}$ between them

(b) inclined at an angle of $\frac{\pi}{6}$ between them

(c) Perpendicular (d) parallel

148. The number of values of x in the interval [0, 3π] satisfying the equation $2\sin^2 x+5\sin x-3=0$ is :

(a) 4 (b) 6 (c) 1 (d) 2

149. The value of the integral, $\int_3^6 \frac{\sqrt{x}}{\sqrt{9-x}+\sqrt{x}}dx$

(a)1/2 (b) 3/2 (c) 2(d) 1**B(BHU-2013)**

150. ABC is a triangle, right angled at A. The resultant of the forces acting along $\overrightarrow{AB}$, $\overrightarrow{AC}$ with magnitudes $\frac{1}{AB}$ and $\frac{1}{AC}$ respctively is the force along $\overrightarrow{AD}$, where D is the foot of the perpendicular from A onto BC. The magnitude of the resultant is

(a) $\frac{AB^2+AC^2}{(AB)^2(AC)^2}$ (b) $\frac{(AB)(AC)}{AB+AC}$

(c) $\frac{1}{AB}+\frac{1}{AC}$ (d) $\frac{1}{AD}$