Max. Marks 450 (+3 -1)

# BHU - 2011

Time 2:30 hrs.

1. For a frequency distribution standard deviation is computed by using the formula

(a) $\sigma=\frac{\sum f(x-\bar{x})}{\sum f}$ (b) $\sigma=\frac{\sum f(x-\bar{x})^2}{\sum f}$

(c) $\sigma=\sqrt{\frac{\sum f(x-\bar{x})^2}{\sum f}}$ (d) $\sigma=\sqrt{\frac{\sum f(x-\bar{x})}{\sum f}}$

2. Which one of the following statement is true for a given distribution ?
   (a) Mean deviation > Standard deviation
   (b) Mean deviation > Standard deviation
   (c) Mean deviation = Standard deviation
   (d) Mean deviation and Standard deviation are not related

3. In case of bionmial distribution, probability of r successes is given by
   (a) ${}^nC_r\, q^{n-r}\, p^r$ (b) ${}^nC_r\, p^{n-r}\, q^r$
   (c) ${}^nC_r\, p^{n-r}$ (d) ${}^nC_r\, q^{n-r}$

4. The standard deviation for Poisson distribution with parameter m is
   (a) m (b) $\sqrt{m}$
   (c) $\frac{1}{m}$ (d) $\frac{1}{\sqrt{m}}$

5. For a normal distribution, we have
   (a) mean = median (b) median = mode
   (c) mode = mean (d) mean - median = mode

6. The value of the correlation coefficient between two variables lies between
   (a) 0 and $\infty$ (b) $-\infty$ and $+\infty$
   (c) 0 and 1 (d) $-1$ and 1

7. The coefficient of regression of X and Y for the data

| | Series X | Series Y |
|---|---|---|
| Average | 25 | 22 |
| S.D. | 4 | 5 |

is
   (a) 1.00 (b) 0.84
   (c) 0.64 (d) 0.31

8. In simplex, when the number of non-zero variables is equal to the number of constraints, the set of values is said to form a
   (a) Feasible solution (b) Basic solution
   (c) Iso-cost solution (d) Optimal solution

9. The linear programming problem Maximine $z = 4x + y$ subject to
$3x + 5y \le 15$,
$5x + 5y \le 15$,
$-x + y \le 2$,
$4x + 5y \le 20$,
$x, y \ge 15$ has
   (a) No solution (b) one solution
   (c) Infinite solution (d) Finite solutions

10. The resultant of two forces P, Q acting at a certain angle is X; and that of P, R acting at the same angle is also X. Then the value of P is
   (a) $\sqrt{Q^2+RX}$ (b) $\sqrt{R^2+QX}$
   (c) $\sqrt{X^2+QR}$ (d) $\sqrt{QR(Q+R)}$

11. ABCDE is pentagon, Forces acting on a particle are represented in magnitude and direction by $\overrightarrow{AB}$, $\overrightarrow{BC}$, $\overrightarrow{CD}$, $\overrightarrow{2DE}$, $\overrightarrow{AD}$, and $\overrightarrow{AE}$. Their resultant is given by
   (a) $\overrightarrow{AE}$ (b) $\overrightarrow{2AE}$
   (c) $\overrightarrow{3AE}$ (d) $\overrightarrow{4AE}$

12. Which one of the following is not a force
   (a) Tension (b) Attraction
   (c) Weight (d) Acceleration

13. Two like parallel forces P and Q act on a rigid body at A and B respectively. If P and Q be interchanged in position, then the point of application of the resultant will be displaced through a distance (along AB)
   (a) $\frac{P+Q}{P-Q}AB$ (b) $\frac{P-Q}{P+Q}AB$
   (c) $(P-Q)AB$ (d) $(P+Q)AB$

14. A beam whose centre of gravity divides it into two portions, a and b, is placed inside a smooth sphere. If $\theta$ be its inclination to the horizon in the position of equilibrium and $2\alpha$ be the angle subtended by the beam at the centre of the sphere, then
   (a) $\tan\theta=(b-a)(b+a)\tan\alpha$ (b) $\tan\theta\frac{b-a}{b+a}\tan\alpha$
   (c) $\tan\theta=\frac{1}{(b-a)(b+a)}\tan\alpha$ (d) $\tan\theta\frac{b+a}{b-a}\tan\alpha$

15. P, Q, R are the points on the sides BC, CA, AB of triangle ABC such that BP : PC = CQ : QA = AR : RB = m : n. If $\Delta$ denote the area of the triangle ABC, then the forces $\overrightarrow{AP}$, $\overrightarrow{BQ}$, $\overrightarrow{CR}$ reduce to a couple whose moment is

(a) $2\frac{m-n}{m+n}\tan\Delta$ (b) $2\frac{m+n}{m-n}\Delta$

(c) $2(m^2-n^2)\Delta$ (d) $2(m^2+n^2)\Delta$

16. Two unlike parallel forces P and Q (P > Q), xm apart act at two points of a rigid body. If the direction of P be reversed, then the resultant is displaced through the distance

(a) 2PQxm (b) $(P^2-Q^2)$ xm

(c) $\frac{2PQ}{P^2-Q^2}$xm (d) $\frac{2PQ}{P^2+Q^2}$xm

17. If the resultant of two forces P and Q acting at a point at an angle $\alpha$ is $(2m+1)\sqrt{P^2+Q^2}$ and when they act at an angle $\left[\frac{\pi}{2}-\alpha\right)$, the resultant becomes $(2m-1)\sqrt{P^2+Q^2}$, then

(a) $\tan\alpha = \frac{1}{m+1}$ (b) $\tan\alpha = \frac{1}{m-1}$

(c) $\tan\alpha = \frac{m+1}{m-1}$ (d) $\tan\alpha = \frac{m-1}{m+1}$

18. To a man walking at 2 km/hr the rain appears to fall vertically when he increases his speed to 4 km/hr it appears to meet him at an angle of 45°. Then the actual velocity of rain is

(a) $\sqrt{2}$ km/hr (b) $\sqrt{3}$ km/hr

(c) $2\sqrt{2}$ km/hr (d) $2\sqrt{3}$ km/hr

19. Acceleation of a moving point is

(a) Tension (b) Attraction

(c) Weight (d) Acceleration

20. If a body is falling freely under gravity, then the acceleration

(a) Is zero (b) Is uniform

(c) Varies as the square of the distance travelled

(d) Varies as the inverse of the distance travelled

21. A point moves with uniform acceleration and $v_1$, $v_2$, $v_3$, denote the average velocities in three successive intervals of time $t_1$, $t_2$, $t_3$, then

(a) $\frac{v_1-v_2}{v_2-v_3}=\frac{t_1+t_2}{t_2+t_3}$ (b) $\frac{v_1+v_2}{v_2+v_3}=\frac{t_1+t_2}{t_2+t_3}$

(c) $\frac{v_1+v_2}{v_2+v_3}=\frac{t_1-t_2}{t_2-t_3}$ (d) $\frac{v_1-v_2}{v_2-v_3}=\frac{t_1-t_2}{t_2-t_3}$

22. A mass m is acted upon by a constant force P lb. wt. under which in t sec it moves a distance of x feet and acquires a velocity v ft/sec. Then x is equal to

(a) $\frac{gP}{2mt^2}$ (b) $\frac{mg}{2v^2P}$

(c) $\frac{gt^2}{2Pm}$ (d) $\frac{mv^2}{2gP}$

23. Masses of 5 kg and 3 kg rest on two inclined planes each of 30° and are connected by a string passing over the common vertex. After 2 seconds the mass of 5 kg is removed. How far up the plane will the 3 kg mass continue to move ?

(a) $\frac{2}{3}$m (b) $\frac{3}{5}$m

(c) $\frac{4}{7}$m (d) $\frac{5}{8}$m

24. The time of flight of a particle, which is projected with velocity u in a direction making an angle $\alpha$, is given by

(a) 2 ug sin$\alpha$ (b) 2 ug cos$\alpha$

(c) $\frac{2\,ug\sin\alpha}{g}$ (d) $\frac{2\,ug\cos\alpha}{g}$

25. If a particle is projected with a velocity u at an angle $\alpha = 45°$, then

(a) The range is minimum

(b) The range is maximum

(c) The range is maximum and equals $\frac{u^2}{2g}$

(d) The time to the highest point is $\frac{u}{g\sqrt{2}}$

**Direction :**

(Question Nos. 26-30) : Data on the candidates, who took an examination in Social Sciences, Mathematics and Science are given below :

| | |
|---|---|
| Passed in all Subjects | 167 |
| Failed in all Subjects | 60 |
| Failed in Social Sciences | 175 |
| Failed in Mathematics | 199 |
| Failed in Science | 191 |
| Passed in Social Sciences only | 62 |
| Passed in Mathematics only | 48 |
| Passed in Science only | 52 |

Answer the following questions based on above data :

26. How many failed in one subject only ?

(a) 56 (b) 61

(c) 144 (d) 152

27. How many failed in two subject only ?
(a) 56 (b) 61
(c) 144 (d) 162

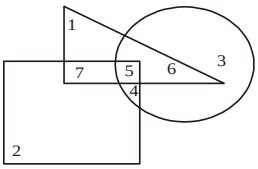
28. How many failed in Social Science only ?
(a) 15 (b) 21
(c) 30 (d) 42

29. How many passed at least in one subject ?
(a) 167 (b) 304
(c) 390 (d) 450

30. How many passed Mathematics and at least in one more subject ?
(a) 94 (b) 170
(c) 203 (d) 210

**Direction :**

(Question Nos. 31-33) : These questions are based on the diagram given below. In the diagram, the triangle stands for graduates, square for membership of professional organisations and the circle for membership of social organisations. Read each statement and find out the appropriate numbers to represent the people covered by statement :

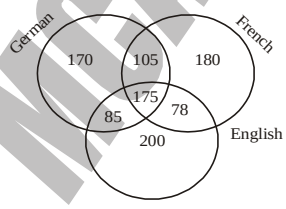



31. Number of graduates in social organizations is represented by
(a) 1 (b) 5 (c) 6 (d) 5 and 6

32. Number of graduates in social organizations only is represented by
(a) 3 (b) 4 (c) 5 (d) 6

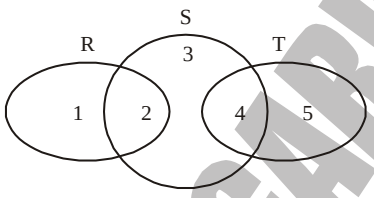
33. Number of graduates in preofessional organizations is represented by
(a) 5 and 7 (b) 4, 5 and 6
(c) 6 and 7 (d) 5, 6 and 7

34. A survey was conducted on a sample of 1000 persons with reference to their knowledge of English, French and Germen. The result is presented in the Venn diagram. The ratio of the number of persons who do not know the three languages to those who know all the three languages is




(a) 1 / 27 (b) 1 / 25
(c) 1 / 550 (d) 175 / 1000

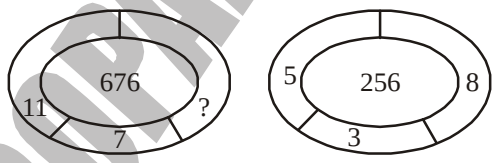
35. The following diagram, R represents businessmen, S represents rich men, T represents honest men. Which number will represent honest rich men ?




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

**Direction :**

(Question Nos. 36-40) : Which number should come in place of question mark (?) in the following questions :




(a) 8 (b) 7
(c) 6 (d) 4

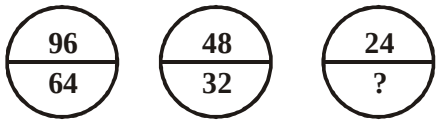
36. How many failed in one subject only ?
(a) 56 (b) 61
(c) 144 (d) 152

37.

| | | |
|---|---|---|
| **1** | **7** | **9** |
| **2** | **14** | **?** |
| **3** | **105** | **117** |

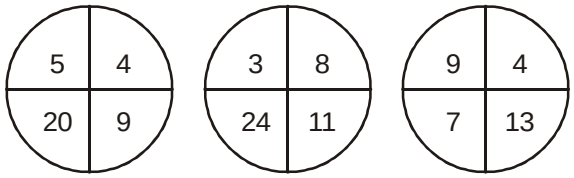
(a) 12 (b) 26 (c) 16 (d) 20

38.

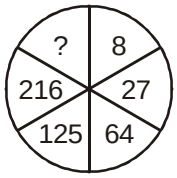



(a) 12 (b) 26 (c) 16 (d) 20

39.



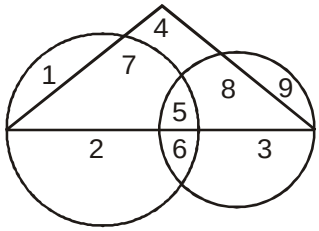

(a) 26 (b) 36 (c) 52 (d) 117

40. 


(a) 729 (b) 343 (c) 305 (d) 4

**Directions :**

**Question Nos. 41-45** The following five questions are based on the following diagram in which the triangle represents female graduates, small circle represents self-employed females and the big circle represents self-employed females with bank loan facility. Numbers are shown in the different sections of the diagram. On the basis of these numbers, answer the following :




41. How many female graduates are self-employed ?
(a) 12 (b) 13
(c) 15 (d) 20

42. How many female graduates are not self-employed ?
(a) 4 (b) 11
(c) 10 (d) 15

43. How many non-graduates female are self-employed ?
(a) 9 (b) 11
(c) 12 (d) 21

44. How many self-employed female graduates are with bank loan facility ?
(a) 5 (b) 7
(c) 12 (d) 20

45. How many non-graduates self-employed female are with bank loan facility ?
(a) 3 (b) 8 (c) 9 (d) 12

46. If PERILOUS is written as RGTKNQWU in a code language then how will OLYMPIC be written in that language ?
(a) QNOAKRE (b) QONARKE
(c) QNAORKE (d) QKNOARE

47. If 'MASTER' is written in as '412536' and 'SERVANT' is written as '2367185' then how will 'REVERENT' be written in the same code language ?
(a) 63736385 (b) 36733685
(c) 85336538 (d) 63536385

48. If the code word of BOMBAY in a certain code is 58 then, what will be the code word for TROMBAY ?
(a) 89 (b) 94
(c) 95 (d) 84

49. In a certain code language 'MT' is coded as 'I am happy'. 'CTR' as 'That black happy' and 'NPS' - 'I very happily'. Then which word is used for 'am' ?
(a) M (b) T (c) P (d) C

50. If CAT is coded as TC then how will SUN be coded?
(a) UN (b) NU
(c) US (d) NS

51. In the following series, find the term in place of question mark (?) 3, 8, 27, 112, 565 ?
(a) 3400 (b) 3396
(c) 1596 (d) 2266

52. In the following number series one number is wrong. Find out the wrong number -
9, 15, 22, 30, 40, 90, 60
(a) 15 (b) 30
(c) 40 (d) 49

53. In the following a missing term is to be find out ( ? )
DKM, FJP, HIS, JHV, ?
(a) HGY (b) IGZ
(c) IGY (d) LGY

54. Letters of which of the alternative answers when placed at the blank places on after another will complete the given letter-series?
a — bbc — aab — cca — bbcc
(a) acba (b) bacb
(c) caba (d) abba

55. In the following question a number-series is given. Which one of the alternatives will replace the question mark (?) ? 4, 9, 19, 39, 79, — ?
(a) 169 (b) 159
(c) 119 (d) 139

56. The headquarters of the World Health Organization is located at : ?
(a) Paris (b) Geneva
(c) Peru (d) Chicago

57. Who was the first Indian to be the President of U.N. General Assembly ?
(a) Natwar Singh (b) Ramesh Bhandari
(c) Smt. Vijai L. Pandit (d) Pandit J.L. Nehru

58. Marketing of agricultural produce in India is through :
(a) Co-operatives (b) Businessmen
(c) Government (d) Individuals

59. The first railway line was laid in India in :
(a) 1836 (b) 1803
(c) 1853 (d) 1860

60. The Vikram Sarabhai Space Centre is located at
(a) Sriharikota (b) Trivandram
(c) Trombay (d) Bangalore

**Directions :**

**Question Nos. 61-62** : In the following questions, choose the word, which is most nearly the same in meaning to the **bold** word and mark it in the Answer Sheet.

61. His style is quite **transparent**.
(a) verbose (b) Involved
(c) Lucid (d) Witty

62. **High**.
(a) Tall (b) Short
(c) Thin (d) Fat

**Directions :**

**Question Nos. 63-64** : In the following questions, choose the word, which is most nearly the OPPOSITE in meaning to the **bold** word and mark it in the Answer Sheet.

63. Lucy is a **smart** girl.
(a) Active (b) Indecent
(c) Casual (d) Lazy

65. In the following questions, the first and the last part of the sentence are numbered 1 and 6. The rest of the sentence is split up into four parts and named P, Q, R and S. These four parts are not given in their proper order. Read the sentence and find out which part of the four combinations is correct. Then find the correct answer and indicate it in the Answer Sheet :
1 : Religion has been used
P : both as a weapon of isolation
Q : to dull awareness
R : about real problems
S : and as morphia
6 : like education, health and employment.
(a) PQRS (b) PSQR
(c) QPSR (d) RPQS

66. The heart and the nerve centre of a computer is its
(a) Output unit (b) Input unit
(c) C.P.U. (d) Memory

67. Main memory unit of a computer
(a) Performs arithmetic
(b) Stores a small amount of data and instructions
(c) Stores bulk of data and instructions
(d) Supervises the working of all the unit

68. The modern digital computer uses
(a) Decimal system (b) Octal system
(c) Binary system (d) All of these

69. The base of the binary number system is
(a) 2 (b) 16 (c) 8 (d) 10

70. Ten data items are to be read in a problem. The control structure needed is
(a) Selection or repetition (b) Only sequential
(c) Only selection
(d) Sequential or repetition

71. C is a
(a) High level language (b) Low level language
(c) High level language with some low level features
(d) Machine language

72. Which of the following codes uses 7 bits to represent a character ?
(a) Output unit (b) Input unit
(c) C.P.U. (d) Memory

73. The Boolean expression X + X'Y equals
(a) X + Y (b) X + XY
(c) Y + YX (d) X'Y + Y'X

74. Let A be a set having n element. The number of binary operations that can be defined on A is
(a) $z^{n^n}$ (b) $n^{n^z}$
(c) $n^{z^n}$ (d) $z^{z^n}$

75. The Boolean expression (A + C) (AB' + AC) (A'C' + B') can be simplified to
(a) AB + A'C (b) A'B + BC
(c) AB + BC (d) AB

76. The harmonic mean of the roots of the equation
$(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$ is
(a) 2 (b) 4 (c) 6 (d) 8

77. The number of quadratic equations which remain unchanged by squaring their roots, is
(a) Zero (b) Four (c) Two (d) Infinite

78. The nth term of the series
$2\frac{1}{2} + 1\frac{7}{13} + 1\frac{1}{9} + \frac{20}{23} + \ldots$ is
(a) $\frac{20}{5n+3}$ (b) $\frac{2}{5n-3}$
(c) $20(5n+3)$ (d) $\frac{20}{5n^2+3}$

79. The coefficient of $x^{15}$ the product
$(x-1)(2x-1)(2^2x-1)(2^3x-1)\ldots(2^{15}x-1)$
is euqal to
(a) $2^{120} - 2^{108}$ (b) $2^{105} - 2^{121}$
(c) $2^{120} - 2^{105}$ (d) $2^{120} - 2^{104}$

80. The value of $\sum_{p=1}^{6} 2\left(\sin\frac{2p\pi}{7} - i\cos\frac{2p\pi}{7}\right)$ is

(a) 1 (b) 2

(c) 2 (d) $-2i$

81. If 1, $\omega$, $\omega^2$, ... $\omega^{n-1}$ are nth roots of unity, then $(1-\omega)(1-\omega^2)\ldots(1-\omega^{n-1})$ is equal to

(a) $n^2$ (b) 0

(c) 1 (d) n

82. The number of subsets of a set containing n distinct object is

(a) ${}^nC_1+{}^nC_2+{}^nC_3+{}^nC_4+\ldots{}^nC_n$ (b) $2^n-1$

(c) $2^n+1$ (d) ${}^nC_0+{}^nC_1+{}^nC_2+\ldots+{}^nC_n$

83. There are n numbered seats around a round table. Total number of ways in which $n_1$ ($n_1<n$) persons can sit around the round table, is equal to

(a) ${}^nC_{n_1}$ (b) ${}^nP_{n_1}$

(c) ${}^nC_{n_1-1}$ (d) ${}^nP_{n_1-1}$

84. If the coefficient of $x^7$ in the expansion of $\left(px^2+\frac{1}{qx}\right)^{11}$ is equal to the coefficient of $x^{-7}$ in the expansion of $\left(px-\frac{1}{qx^2}\right)^{11}$, then

(a) pq = 1 (b) (p/q) = 1

(c) p + q = 1 (d) p – q = 1

85. In the bionomial expansion of $(a-b)^n$, $n \le 5$, the sum of the 5th and 6th terms is zero. Then (a/b) equals

(a) (n - 4) / 5 (b) (n - 5) / 6

(c) 5 / (n - 4) (d) 6 / (n - 5)

86. If $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$, where x, y, z are unequal and non-zero real numbers, then xyz is equal to

(a) 1 (b) 2

(c) –1 (d) –2

87. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 3 \\ 1 & -5 \\ 4 & 1 \end{bmatrix}$, 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) $\begin{bmatrix} 3 & 1 \\ -9 & 3 \end{bmatrix}$

88. If $A = \begin{bmatrix} 1 & -2 & -3 \\ 2 & 1 & -2 \\ 3 & 2 & 1 \end{bmatrix}$, then A is

(a) Symmetric matrix

(b) A skew symmetric matrix

(c) A singular matrix (d) Non-singular matrix

89. If $x = \frac{1}{2}(\sqrt{3}+1)$, then the value of expression $4x^3+2x^2-8x+7$ equal to

(a) 10 (b) 5

(c) 0 (d) -2

90. If the ratio of the sum of m terms and n terms of an A.P. be $m^2 : n^2$, then its ratio of its mth and nth terms will be

(a) $\frac{m-n}{m+n}$ (b) $\frac{2m-1}{2n-1}$

(c) $\frac{2m+1}{2n+1}$ (d) $\frac{m+n}{m-n}$

91. If in a G.P. sum of n terms is 255, the last term is 128 and the common ratio is 2, then the value of n is equal to

(a) 2 (b) 4

(c) 8 (d) 16

92. The value of $7\log(16/15) + 5\log(25/24) + 3\log(81/80)$ is equal to

(a) 0 (b) log 2

(c) log 3 (d) log 5

93. If A = {a, b, d, l}, B = {c, d, f, m} and {a, l, m, o}, then $C \cap (A \cup B)$ is given by

(a) {a, d, l, m} (b) {b, c, f, o}

(c) {a, l, m} (d) {a, b, c, d, f, l, m, o}

94. The number of subsets of an n elementric set is

(a) 2n (b) n

(c) $2^n$ (d) $\frac{1}{2}2^n$

95. If A = {1, 2, 3}, B = {4, 5, 6}, which of the following are relations from A to B?

(a) {(1, 5), (2, 6), (3, 4), (3, 6)}

(b) {(1, 6), (3, 4), (5, 2)}

(c) {(4, 2), (4, 3), (5, 1)} (d) B x A

96. If f = {(1, 1), (2, 3), (0, –1), (–1, –3)} be a function described by the formula f(x) = ax + b for some integers a, b, then the value of a, b is

(a) a = – 1, b = 3 (b) a = 3, b = 1

(c) a = – 1, b = 2 (d) a = 2, b = –1

97. A straight line passes through the pont 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 $x+\sqrt{3}y = 12$

(a) 1.5 (b) 2.5

(c) 3.5 (d) 4.5

98. The co-ordinates of the orthocentre of the triangle formed by the lines $2x^2 - 2y^2 + 3xy + 3x + y + 1 = 0$ and $3x + 2y + 1 = 0$ are

(a) $\left(\frac{4}{5}, \frac{3}{5}\right)$ (b) $\left(\frac{-3}{5}, \frac{-1}{5}\right)$

(c) $\left(\frac{1}{5}, \frac{4}{5}\right)$ (d) $\left(\frac{2}{5}, \frac{1}{5}\right)$

99. The equation $\sqrt{(x^2+4y^2-4xy+4)} + x - 2y = 1$ represents a

(a) Straight line (b) Circle

(c) Parabola (d) Pair of lines

100. Two circles $x^2 + y^2 = 5$ and $x^2 + y^2 - 6x + 8 = 0$ are given. Then the equation of the circle through their point of intersection and the point (1, 1) is

(a) $x^2 + y^2 - 6x + 4 = 0$

(b) $x^2 + y^2 - 3x + 1 = 0$

(c) $x^2 + y^2 - 4x + 2 = 0$

(d) $x^2 + y^2 - 5x + 3 = 0$

101. An equilateral triangle is inscribed in a parabola $y^2 = 4ax$ whose vertex is at the vertex of the parabola. The lenght of its side is

(a) $a\sqrt{3}$ (b) $2a\sqrt{3}$

(c) $8a\sqrt{3}$ (d) $4a\sqrt{3}$

102. If in ellipse the lenght of latus rectum is equal to half of major axis, then eccentricity of the ellipse is

(a) $\sqrt{3}/2$ (b) 1/2

(c) $\sqrt{2}$ (d) $1/\sqrt{3}$

103. The difference of the focal distances of any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

(a) a (b) 2a

(c) b (d) 2b

104. Every homogenous equation of second degree in x and y represent a pair of lines

(a) Parallel to x-axis (b) Perpendicular to y-axis

(c) $8a\sqrt{3}$ (d) Parallel to y-axis

105. The value of $\lim_{x\to -2} \frac{\tan \pi x}{x+2} + \lim_{x\to\infty} \left(1+\frac{1}{x^2}\right)^x$ is equal to

(a) $\pi + 1$ (b) $\pi - 1$

(c) $\pi$ (d) 3

106. If $f(x) = \begin{cases} 0 & at \quad x = 0 \\ \frac{1}{2} - x + [x] & if \quad 0 < x < \frac{1}{2} \\ \frac{1}{2} & if \quad x = \frac{1}{2} \\ \frac{2}{3} - x & if \quad \frac{1}{2} < x < 1 \\ 1 & if \quad x = 1 \end{cases}$ then $f(x)$ is

(a) Continuous at x = ½ (b) Continuous at x = 1

(c) Continuous at x = 0 (d) Discontinuous at x = 0

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

(a) –1 (b) 0

(c) 1/x (d) x

108. The differential coefficient of $x^x$ is

(a) $x^x \log x$ (b) $x^x\left(\log x + \frac{1}{x}\right)$

(c) $x^x (\log x + 1)$ (d) $x\, x^{x-1}$

109. The straight line $\frac{x}{a} + \frac{y}{b} = 1$ touches the curve $y = be^{-x/a}$ at the point

(a) where it crosses the y-axis

(b) where it crosses the x-axis

(c) (0, 0) (d) (1, 1)

110. The equation of tangent to the curce $y^2 = 2x^3 - x^2 + 3$ at the point (1, 4) is

(a) y = 2x (b) x = 2y

(c) y = 4x (d) x = 4y

111. The length of the normal at the point (2, 4) to the parabola $y^2 = 8x$ is

(a) $4\sqrt{2}$ (b) 4

(c) $\sqrt{6}$ (d) $2\sqrt{3}$

112. The normal to the curve
x = a (cos θ + θ sin θ), y = a (sin θ – θ cos θ) at any point θ is such that it

(a) Passes through the origin

(b) Makes a constant angle with the x-axis

(c) Makes a constant angle with the y-axis

(d) Is at constant distance from the origin

113. The function $f(x) = \sin x (1 + \cos x)$ has a maximum value when

(a) $x = \frac{1}{2}\pi$ (b) $\frac{1}{3}\pi$

(c) $\frac{1}{4}\pi$ (d) $\frac{1}{5}\pi$

114. The equation of tangent to the curve $y^2 = 2x^3 - x^2 + 3$ at the point (1, 4) is

(a) $x = -\frac{1}{2}$ (b) $x = \frac{1}{2}$

(c) $x = 1$ (d) $x = -1$

115. The value of $\int \log x \, dx$ is

(a) $x(\log x + 1)$ (b) $x(\log x - 1)$

(c) $\log x(x + \log x)$ (d) $x(x - \log x)$

116. The value of $\int \frac{\tan^{-1} x}{1+x^2} dx$ is

(a) $e^{\tan^{-1}x}$ (b) $e^{-\tan^{-1}x}$

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

117. The value of $\int \frac{x-1}{(x-2)(x-3)} dx$ is

(a) $2\log(x-2) + \log(x-3)$

(b) $\log(x-2) - \log(x-3)$

(c) $\log(x-2) - \log(x-3)$

(d) $-\log(x-2) + 2\log(x-3)$

118. The value of $\int_0^{\pi/4} \frac{\sin\theta + \cos\theta}{9 + 16\sin 2\theta} d\theta$ is

(a) $\frac{1}{2}\log 2$ (b) $\frac{1}{20}\log 5$

(c) $\frac{1}{20}\log 3$ (d) $\frac{1}{30}\log 7$

119. The volume of a right circular cylinder of height h and radius of base 4 is

(a) $\frac{1}{3}\pi r^2 h$ (b) $\pi r^2 h$

(c) $\frac{4}{3}\pi r^2 h$ (d) $\frac{1}{2}\pi r^2 h$

120. If $l$ denoted slant height $r_1$ and $r_2$ denote the radii of the frustum of cone, then curved surface of cone is

(a) $\pi l(r_1 + r_2)$ (b) $\frac{1}{2}\pi l(r_1 - r_2)$

(c) $x = 1$ (d) $\pi r_1 r_2 [l + (l^2 + r_1 r_2)$

121. The degree of the differential equation

$$\left[3 + 4\left(\frac{dy}{dx}\right)^2 + 5\left(\frac{d^2y}{dx^2}\right)\right]^{2/3} = \left(\frac{d^3y}{dx^3}\right)^2 \text{ is}$$

(a) 3 (b) 4

(c) 5 (d) 6

122. The particular integral of the differential equation $(D^2 - 2D + 1)\, y = xe^x \sin x$ is given by

(a) $e^x \sin(x + 1)$ (b) $x(e^x \cos x + \sin x)$

(c) $e^x(x \cos x + \sin x)$ (d) $-e^x(x \sin x + 2\cos x)$

123. The value of $\frac{1}{(D-3)(D-2)} e^{2x}$ is

(a) $x e^{2x}$ (b) $2x e^{2x}$

(c) $-x e^{2x}$ (d) $-2x e^{2x}$

124. Solution of the differential equaion

$(1 + y^2)\, dx + (x - e^{-\tan^{-1} y})\, dy = 0$ is

(a) $y e^{\tan^{-1} x} = \tan^{-1} x + c$ (b) $x e^{\tan^{-1} y} = \tan^{-1} y + c$

(c) $y = \tan^{-1} x\, e^{\tan^{-1} x} + c$ (d) $y = x e^{-\tan^{-1} x} + c$

125. Let the vectors $\vec{a}, \vec{b}, \vec{c}$ be the position vectors of the vertices P, Q, R of a triangle respectively. Which of the following represents the area of the triangle ?

(a) $\frac{1}{2}\left|\vec{a} \times \vec{b}\right|$ (b) $\frac{1}{2}\left|\vec{b} \times \vec{c}\right|$ (c) $\frac{1}{2}\left|\vec{c} \times \vec{a}\right|$

(d) $\frac{1}{2}\left|\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}\right|$

126. If $\vec{a}$ and $\vec{b}$ represent two adjacent sides $\overrightarrow{AB}$ and $\overrightarrow{BC}$ respectively of a parallelogram ABCD, then its diagonals $\overrightarrow{AC}$ and $\overrightarrow{DB}$ are equal to

(a) $\vec{a} + \vec{b}$ & $\vec{a} - \vec{b}$ (b) $\vec{a} - \vec{b}$ & $\vec{a} + \vec{b}$

(c) $\vec{a} + 2\vec{b}$ & $\vec{a} - 2\vec{b}$ (d) $2\vec{a} + \vec{b}$ & $2\vec{a} - \vec{b}$

127. Let ABCD be a parallelogram. If $\vec{a}, \vec{b}, \vec{c}$ be the position vectors of A, B, C respectively with reference to the origin O, then the position vector of D with reference to O is

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

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

128. If two vectors $\vec{a}$ and $\vec{b}$ are parallel and have equal magnitudes, then

(a) They are not equal

(b) They may or may not be equal

(c) They have the same sense of direction

(d) They do not have the same direction

129. If $\vec{a}$ and $\vec{b}$ are two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if

(a) $\theta = \frac{\pi}{3}$ (b) $\theta = \frac{\pi}{4}$

(c) $\theta = \frac{\pi}{2}$ (d) $\theta = \frac{2\pi}{3}$

130. If the position vectors of A and B are $\vec{a}$ and $\vec{b}$ respectively, then the position vector of a point P which divides AB in the ratio 1:2 is

(a) $\frac{\vec{a}+\vec{b}}{3}$ (b) $\frac{\vec{b}+2\vec{a}}{3}$

(c) $\frac{\vec{b}+2\vec{a}}{3}$ (d) $\frac{\vec{b}-2\vec{a}}{3}$

131. Point A is $\vec{a} + 2\vec{b}$, P is $\vec{a}$ and P divides AB in the ratio 2:3. The position vector of B is

(a) $2\vec{a} - \vec{b}$ (b) $\vec{b} - 2\vec{a}$

(c) $\vec{a} - 3\vec{b}$ (d) $\vec{b}$

132. $\vec{a} \cdot \vec{b} = 0$ implies only

(a) $\vec{a} = 0$ (b) $\vec{b} = 0$

(c) $\theta = 90°$

(d) either $\vec{a} = 0$ or $\vec{b} = 0$ or $\theta = 90°$

133. If θ be the angle between the vecots $4\left(\hat{i} - \hat{k}\right)$ and $\hat{i} + \hat{j} + \hat{k}$, then θ is

(a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$

(c) $\frac{\pi}{4}$ (d) $\cos^{-1}\left(1/\sqrt{3}\right)$

134. If $[\vec{a}\ \vec{b}\ \vec{c}]$ is the scalar triple product of three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, then $[\vec{a}\ \vec{b}\ \vec{c}]$ is equal to

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

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

135. If θ is the angle between vectors $\vec{a}$ and $\vec{b}$, then $\left|\vec{a} \times \vec{b}\right| = \left|\vec{a} \cdot \vec{b}\right|$ when θ is equal to

(a) 0 (b) 45°

(c) 135° (d) 180°

136. If $\vec{a} = 4\hat{i} + 2\hat{j} - 4\hat{k}$, $\vec{b} = -12\hat{i} - 6\hat{j} + 15\hat{k}$. then the vectors $\vec{a}$ and $\vec{b}$ are

(a) Parallel (b) Non-parallel

(c) Orthogonal (d) Non-coplanar

137. If the position vectors of three points are $\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} - 4\vec{c}, -7\vec{b} + 10\vec{c}$. then the three points are

(a) Collinear (b) Coplanar

(c) Non-coplanar (d) Neither

138. If $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$. then $\vec{A} \times \vec{B}$ will be given by

(a) $2\hat{i} - 2\hat{j} - \hat{k}$ (b) $6\hat{i} - 3\hat{j} + 2\hat{k}$

(c) $\hat{i} - 10\hat{j} - 18\hat{k}$ (d) $\hat{i} + \hat{j} + \hat{k}$

139. If $If\ |\vec{a}| = |\vec{b}|, then\ (\vec{a}+\vec{b}).(\vec{a}-\vec{b})$ is

(a) + tive (b) – tive

(c) unity (d) Zero

140. The vector $2\hat{i} + \hat{j} - \hat{k}$ is perpendicular to $\hat{i} - 4\hat{j} + \lambda\hat{k}$, if $\lambda$ is equal to

(a) 0 (b) – 1

(c) – 2 (d) – 3

141. The value of cos 10° – sin 10° is

(a) Positive (b) Negative

(c) 0 (d) 1

142. If sin α = sin β, then the angle α and β are related by

(a) $\alpha = 2n\pi + (-1)^n \beta$ (b) $\alpha = n\pi \pm \alpha$

(c) $\beta = n\pi + (-1)^n \alpha$ (d) $\beta = (2n+1)\pi + \alpha$

143. The value of $\frac{1-\tan^2 15°}{1+\tan^2 15°}$ is

(a) $\sqrt{3}$ (b) $\frac{\sqrt{3}}{2}$

(c) 1 (d) 2

144. The general solution of the trigonometrical equation $\sin x + \cos x = 1$ is given by

(a) $x = 2n\pi, n = 0 \pm 1, \pm 2, ..$

(b) $x = 2n\pi + \frac{\pi}{2}, n = 0 \pm 1, \pm 2, ...$

(c) $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}, n = 0 \pm 1, \pm 2, ...$

(d) $x = n\pi + (-1)^n \frac{\pi}{4}, n = 0 \pm 1, \pm 2, ...$

145. From the top of a lighthouse 60 metres high with its base at the sea-level, the angle of depression of a boat is 15°.The distance of the boat from the foot of the lighthouse is

(a) $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)60 metres$ (b) $\left(\frac{\sqrt{3}+1}{\sqrt{3}-1}\right)60 metres$

(c) $\frac{\sqrt{3}+1}{\sqrt{3}-1} metres$ (d) $\frac{\sqrt{3}-1}{\sqrt{3}+1} metres$

146. If $\sin a = -\frac{3}{5}\left(\pi < \alpha < \frac{3}{2}\pi\right)$, then the value of $\cos \frac{1}{2}\alpha$ is

(a) $-\frac{1}{\sqrt{10}}$ (b) $\frac{1}{\sqrt{10}}$ (c) $\frac{3}{\sqrt{10}}$ (d) $\frac{7}{\sqrt{10}}$

147. The value of tan 9° - tan 27° - tan 63° + tan 81° is

(a) 1 (b) 2

(c) 3 (d) 4

148. In a $\Delta ABC$,

cosec A (Sin B cos C + Cos B sin C) equals

(a) $\frac{c}{a}$ (b) $\frac{a}{c}$

(c) 1 (d) 0

149. Three coins are thrown together. The probability of getting two or more heads is

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

(c) $\frac{2}{3}$ (d) $\frac{3}{8}$

150. The average of n numbers $x_1, x_2, x_3, ..., x_n$ is A. If $x_n$ is replaced by $(n + 1) x_n$, then the new average is

(a) $\frac{(n-1)A + nx_n}{n}$ (b) $\frac{nA + (n+1)x_n}{n}$

(c) $\frac{(n+1)A + nx_n}{n}$ (d) $A + x_n$





# BHU MCA-2011 ORIGINAL PAPER

## ANSWERS AS PROVIDED BY BHU

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 - 5 | C | B | A | B | D | 51 - 55 | B | C | D | A | B | 101 - 105 | D | W | B | C | A |
| 6 - 10 | D | W | B | B | C | 56 - 60 | B | C | W | C | B | 106 - 110 | D | A | C | A | W |
| 11 - 15 | C | D | B | B | W | 61 - 65 | C | A | W | C | B | 111 - 115 | A | D | B | C | B |
| 16 - 20 | C | D | C | B | B | 66 - 70 | C | B | C | A | D | 116 - 120 | W | D | C | B | A |
| 21 - 25 | D | D | W | C | B | 71 - 75 | C | A | A | W | W | 121 - 125 | D | D | C | B | D |
| 26 - 30 | B | D | A | C | C | 76 - 80 | B | B | A | B | C | 126 - 130 | A | C | B | D | B |
| 31 - 35 | D | D | A | B | D | 81 - 85 | D | D | B | A | A | 131 - 135 | C | W | A | C | B |
| 36 - 40 | A | A | C | B | B | 86 - 90 | C | B | B | A | B | 136 - 140 | A | W | C | D | C |
| 41 - 45 | D | A | D | C | C | 91 - 95 | C | B | C | C | A | 141 - 145 | A | C | B | W | B |
| 46 - 50 | C | A | B | A | D | 96 - 100 | D | C | B | A | W | 146 - 150 | C | D | C | B | D |

Note : W means question is incorrect and for incorrect questions full marks are given to students.