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ENTRANCE TEST FOR MSc Big Data Analytics

Date: 8 June 2019 *Max Marks: 96*
Student's Name (in block letters): Time: 2 hrs
Signature:

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1. Starting from a tree a bird flies back and forth an approaching cyclist and the tree. The cyclist speeds at 10km/hr, and the bird flies at 30km/hr. How much distance the bird flies before the cyclist passes by the tree when the initial distance between the tree and the cyclist is 2km?

   a. 10km b. 5km c. 4.5km d. 6km e. None of the above

2. A frog jumps from the floor of an n-step stair to the top of the stair in k jumps, where $k \leq n$ In how many different ways can the frog reach the top of the stair?

   a. $n \log n$ b. $k \log n$ c. $2^k \cdot (n+1)/2$ d. 2^{n-1} e. None of the above

3. In a win-or-lose game, the winner gets 2 points whereas the loser gets 0. Six players A, B, C, D, E and F play each other in a preliminary round from which the top three players move to the final round. After each player has played four games, A has 6 points, B has 8 points and C has 4 points. It is also known that E won against F. In the next set of games D, E and F win their games against A, B and C respectively. If A, B and D move to the final round, the final scores of E and F are, respectively,

   a. 2 and 4 b. 2 and 2 c. 4 and 2 d. 4 and 4 e. 0 and 6

4. Let the straight lines $-x + y = 1$, and $x + y = 1$ be denoted by A, B respectively. A moves along the downward normal at a speed of 5cm/sec, while B moves along the upward normal at the same rate. The locus of the point of intersection of A and B is a line segment with slope

   a. 1/2 b. $\sqrt{3}/2$ c. 1/5 d. 0 e. indeterminate

5. Three chests A, B and C are labelled as `100 gold coins`, `50 gold coins + 50 silver coins` and `100 silver coins` respectively. All 3 chests are wrongly labelled. What is the minimum effort to determine the chest having 100 gold coins.

   a. pick 1 coin from chest A
   b. pick 1 coin from chest B
   c. pick 1 coin from chest C
   d. pick 1 coin from each of chests A and C
   e. pick 1 coin from each of the 3 chests

6. If A^2+B^2, AB and $A+B$ are all integers then

   a. Both A and B must be integers
   b. Both A and B must be fractions
   c. Both A and B must be rational
   d. Nature of A and B cannot be determined
   e. Both A and B can be irrational

7. Four brothers A,B,C and D are burglars. They usually perform any burglary in a group of two among them. After a burglary in a jewelry shop, police investigated them. The answers given by them are:

   A said: I didn't do it and don't know who did
   B said: C and D have done it
   C said: B and D have done it
   D said: A and B have done it

   Out of these brothers, A is elder than C, D is younger than A but elder than B and B is elder than C. Moreover, the eldest brother will always speak the truth and the youngest one will always tell a lie. Among the other two brothers, if one tells a lie, the other one will definitely speak the truth. Which pair of brothers were involved in the burglary.

a. A and B b. B and C c. B and D d. C and D e. A and C

8. A 1 inch x 1 inch x 1 inch solid cube is cut to half in all directions creating 8 smaller cubes of 1/2 inch x 1/2 inch x 1/2 inch. The difference of surface area in sq. inch for all the smaller cubes taken together to the original cube will be

   a. 0 b. 2 c. 4 d. 6 e. 8

9. There are 3 statements:

   S1: Those who like paintings like flowers.

   S2: Those who like running like music.

   S3: Those who do not like music do not like flowers.

   From the above 3 statements following propositions have been made. Which of them are true.

   P1: Those who like running like flowers

   P2: Those who like paintings like music

   P3: Those who like flowers do not like running

   P4: Those who like running do not like paintings

   P5: Those who like paintings like running

   a. P1, P3 and P5 only b. P4 and P5 only c. P2 and P3 only d. P1 and P4 only e. P2 only

10. In a competition, a school awarded medals in different categories. 35 medals in dance, 12 medals in dramatics and 18 medals in music. If these medals went to a total of 45 persons and only 4 persons got medals in all the three categories, how many received medals in exactly two of these categories?

    a. 3 b. 14 c. 5 d. 9 e. 12

11. How many ways can the letters of the word TRIANGLE be arranged if the first three letters must be RAN (in any order) and the last letter must be a vowel?

    a. $3! \times \times 4!$ b. $3! \times 2 \times 4!$ c. $5! \times 3!$ d. $7! \times 2!$ e. $7!$

12. An equilateral triangle is drawn by joining the midpoints of the sides of another equilateral triangle. A third equilateral triangle is drawn inside the second one joining the midpoints of the sides of the second equilateral triangle, and the process continues infinitely. Note that an equilateral triangle is a triangle in which all three sides are equal. Find the sum of the perimeters of all the equilateral triangles, if side of the largest equilateral triangle is 20 units.

    a. 140 b. 120 c. 240 d. 60 e. None of the above

13. Find the number of triangles in an octagon.

    a. 72 b. 128 c. 56 d. 320 e. 112

14. The maximum distance between two points of the unit cube is

    a. $\sqrt{2}$ b. $\sqrt{2}+1$ c. $\sqrt{3}$ d. $\sqrt{2}+2$ e. None of the above

15. Given a matrix $\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{-1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix}$ and a line equation $y = x + 5$. What is the equation of the resulting object if every coordinate on the line is multiplied by the matrix.

    a. $y = 5$ b. $x = 5$ c. $y = -5/\sqrt{2}$ d. $x = -5/\sqrt{2}$ e. None of the above

16. Two poles, AB of length two metres and CD of length twenty metres are erected vertically with bases at B and D. The two poles are at a distance not less than twenty metres. It is observed that $\tan \angle ACB = 2/77$. The distance between the two poles is

a. 80 m b. 72 m c. 68 m d. 24 m e. 24.27 m

17. An isosceles triangle with base 6 cms. and base angles 30âŮę each is inscribed in a circle. A second circle touches the first circle and also touches the base of the triangle at its midpoint. If the second circle is situated outside the triangle, then its radius (in cms.) is

a. $3\sqrt{3}/2$ b. $\sqrt{3}/2$ c. $\sqrt{3}$ d. $4/\sqrt{3}$ e. $2\sqrt{3}$

18. Consider a circle with centre O. Two chords AB and CD extended intersect at a point P outside the circle. If $\angle AOC = 43^o$ and $\angle BPD = 18^o$, then the value of $\angle BOD$ is

a. 36^o b. 29^o c. 28^o d. 7^o e. 25^o

19. Suppose $ABCD$ is a quadrilateral such that $\angle BAC = 50^o, \angle CAD = 60^o, \angle CBD = 30^o$ and $\angle BDC = 25^o$. If E is the point of intersection of AC and BD, then the value of $\angle AEB$ is

a. 75^o b. 80^o c. 85^o d. 95^o e. 110^o

20. If A, B, C are the angles of a triangle and $\sin^2 A + \sin^2 B = \sin^2 C$, then C is equal to

a. 30^o b. 60^o c. 90^o d. 45^o e. none of the above

21. Let $f(x) = [x^2 - \frac{1}{4}]$, for $-\frac{1}{2} \leq x \leq 1$ where $[y]$ denotes the greatest integer less than or equal to y for $y \in R$. Then which of the following is a correct statement

a. f is continuous exactly at one point in $[-\frac{1}{2}, 1]$.
b. The range of f is $\{-1, 0, 1\}$
c. f is constant in the interval $[-\frac{1}{4}, \frac{3}{4}]$
d. $\int_{-\frac{1}{2}}^{1} |x| f(x)dx = -\frac{1}{4}$
e. None of the above

22. In the interval $(0, 2\pi)$, the function $f(x) = \sin\left(\frac{1}{x^3}\right)$

a. never changes sign

b. changes sign only once

c. changes sign exactly twice

d. changes sign more than twice, but finitely many times

e. changes sign infinitely many times

23. Let P be a variable point on a circle C and Q be a fixed point outside C. If R is the mid-point of the line segment PQ, then the locus of R is

a. a circle b. an ellipse c. a line segment d. segment of a parabola
e. segment of a hyperbola

24. The value of $\lim_{n\to\infty}(1 + 8 + 27 + \cdots + n^3)/n^4$ is:

a. 3/4 b. 1/4 c. 0 d. 1 e. 4

25. The value of the integral $\int_2^3 \frac{dx}{\log_e x}$

a. is less than 2 b. is equal to 2 c. lies in the interval $(2, 3)$
d. is equal to 3 e. is greater than 3

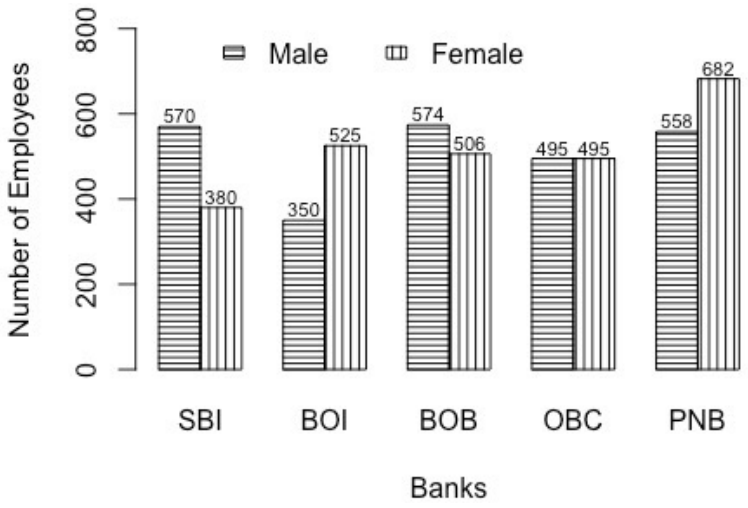
26. Consider the functions $f_1(x) = x, f_2(x) = 2 + \log_e x, x > 0$ (where e is the base of natural logarithm). The graphs of the functions intersect

a. never in $(0, \infty)$
b. once in $(0, 1)$ and never in $(1, \infty)$
c. once in $(0, 1)$ and once in (e^2, ∞)
d. once in $(0, 1)$ and once in (e, e^2)
e. more than twice in $(0, \infty)$

27. The coefficient of $a^3b^4c^5$ in the expansion of $(bc + ca + ab)^6$ is

a. $\frac{12!}{3!4!5!}$ b. $\binom{6}{3}3!$ c. 33 d. $3\binom{6}{3}$ e. 3.4.5

Direction: Following figure shows the number of male and female employees in five different banks in one of the states in India. Study the data carefully and answer the questions 28-to-32 given below:



28. The number of female employees working in OBC and PNB together is approximately how much percentage less than the total number of employees working in PNB?

a. 10% b. 8% c. 5% d. 12% e. 25%

29. What is the average number of female employees working in all the banks?

a. 503.6 b. 523.6 c. 533.6 d. 493.6 e. None of these

30. What is the ratio of number of male employees who are working in SBI and BOI together to the number of female employees who are working in same bank?

a. 190 : 193 b. 83 : 90 c. 184 : 181 d. 101 : 104 e. None of these

31. The total number of employees who are working in BOM is 80% of the total number of employees who are working in BOB. Find the percentage of female employees who are working in BOM if the number of male employees is 648.

a. 75% b. 60% c. 80% d. 25% e. 55%

32. If 30% of the female employees who are working in SBI is post graduate, find the number of female employees who are working in SBI are not post graduate.

a. 269 b. 266 c. 272 d. 278 e. 285