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NIFAS SILK LAFTO SUB-CITY ADMINISTRATION EDUCATION BUREAU

NIFAS SILK LAFTO

GRADE 12 MATHEMATICS (NATURAL SCIENCE) MODEL EXAMINATIONS

FIRST SEMISTER 2016E.C.

NUMBER OF QUESTIONS: 65 **TIMES ALLOWED: 3 HOURS**

GENERAL DIRECTIONS

THIS BOOKLET COINTAINS **MATHEMATICS (NATURAL SCIENCE)**. IN THIS EXAMINATION, THERE ARE A TOTAL OF **65 MULTIPLE CHOICE QUESTIONS**. CAREFULLY SELECT THE BEST ANSWER AND BLACKED ONLY THE LETTER OF YOUR CHOICE ON THE SEPARATE ANSWER SHEET PROVDED. FOLLOW THE INSTRUCTIONS ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY.USE ONLY PENCIL TO MARK YOUR ANSWERS. YOUR ANSWER MARK SHOULD BE HEAVY AND DARK COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNESESSARY MARKS COMPELETELYFROM YOUR ANSWER SHEET.

YOU ARE ALLOWED TO WORK ON THE EXAM FOR **3 HOURS**. WHEN TIME IS CALLED,YOU MUST IMMEDIATELY STOP WORKING,PUT YOUR PENCIL DOWN, AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

PLEASE MAKE SURE THAT YOUR HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU START TO WORK ON THE EXAMINATION.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

I. Choose the correct answer for the given alternatives and write your answer in the space provided.

1. The simplest form of $\sqrt{20}+\frac{\sqrt{3}}{3}(\sqrt{6}-2\sqrt{15})$ is equal to

A. $\sqrt{5}$ C.$2\sqrt{5}$

B. $\sqrt{2}$ D. $-\sqrt{5}$

2. What is the value of k so that the quadratic equation $4x^2-2x+k^2-2k+1=0$ can have exactly one solution?

A.$k=2\wedge k=6$ C.$k=\frac{1}{2}\wedge k=\frac{-3}{2}$

B.$k=1\wedge k=\frac{1}{3}$ D. $k=\frac{1}{2}\wedge k=\frac{3}{2}$

3. Among 2318 student in a School, 15 student failed in English, 25 students failed in Mathematics and 12 student failed in both English and Mathematics. How many students passed both in English and in Mathematics?

A. 2300 C.2290

B. 2346 D. 2278

4. What are the domain and the range of the relation

$R=\{(x,y):y\le x, x\le 4, y\ge 0; x\in R \text{ and } y\in R\}$?

A.$0\le x\le 4\wedge 0\le y\le 4$ C.$\{x\in R: x\ge 0\}\wedge\{y\in R: y\ge 4\}$

B.$0<x<4\wedge 0<y<4$ D. $\{x: x\ge 4\}\wedge\{y: y\ge 0\}$

5. Given ΔABC. If $AB=15\,cm, BC=13\,cm\wedge AC=14\,cm,$ what is the area of ΔABC ?

A. $21\,cm^2$ C.$42\,cm^2$

B.$30\,cm^2$ D. $84\,cm^2$

6. If a die and a coin are tossed together. What are the probability of getting a tail and an odd number?

A. $\frac{1}{3}$ C. $\frac{1}{2}$

B. $\frac{1}{4}$ D. $\frac{1}{12}$

7. What is the magnitude of the vector whose initial point is at $(-2,2)$ and terminal point is $(1,6)$?

A. $2\sqrt{2}$ C. 2

B. 5 D. $\sqrt{5}$

8. Which one of the following is **not** true about the Polynomial functions?

A. The graph of polynomial function of degree n meets the x-axis at most n times.

B. The graph of polynomial function of degree n has at most n-1 turning points.

C. If polynomial function has odd degree and leading coefficient is negative, then the graph rises to the left and

falls to the right.

D. If polynomial function has even degree and leading coefficient is positive, then the graph rises to the left and

falls to the right.

9. When $f(x)=3x^7-ax^6+5x^3-x+11$ is divided by $x+1$, the remainder is 15. What is the value of a ?

A. -11 C. 12

B. 13 D. -5

10. The solution set of $\log(x+3)+\log x=1$ is equal to

A. $\{-5,2\}$ C. $\{2\}$

B. $\{-5\}$ D. $\{\}$

11. Which one is **not** true about $f(x)=b^x, b>0 \wedge b \neq 1$ defines an exponential function?

A. The domain is the set of all real numbers

B. The range is the set of all real numbers

C. The graph includes the point $(0,1)$

D. The range is the set of all positive real numbers

12. The solution set of $|4-6x| \leq 2$ can be given by

A. ¿

C. $\left[\frac{1}{3},1\right]$

B. $\left(\frac{1}{3},1\right)$

D. $\left(-\infty,\frac{1}{3}\right) \cup (1,\infty)$

13. Which one of the following is the solution set for $2x^2-7x+3<0$?

A. $(-6,-1)$

C. $\left(-\infty,\frac{1}{2}\right) \cup (3,\infty)$

B. $\left[\frac{1}{2},3\right]$

D. $\left(\frac{1}{2},3\right)$

14. What is the equation of the line passing through $(2,-4) \wedge (-1,5)$?

A. $3x+y+2=0$

C. $-y-3x-2=0$

B. $y+3x-2=0$

D. $3x-y-2=0$

15. What is the height of a tree which casts a shadow of $14\sqrt{3}m$ when the angle of elevation of the

Sun is 60°?

A. the tree is 126 m high

C. the tree is 42 m high

B. the tree is 14 m high

D. the tree is 7 m high

16. If $\sin\theta=\frac{-1}{2}$ and θ is in third quadrant, what is the value of $\cot\theta$?

A. $-\sqrt{3}$

C. $\frac{\sqrt{3}}{2}$

B. $\sqrt{3}$

D. $\frac{-\sqrt{3}}{2}$

17. What is the area of an equilateral triangle inscribed in a circle with radius 2cm?

A. $18\sqrt{3}cm^2$

C. $9\sqrt{3}cm^2$

B. $\sqrt{3}cm^2$

D. $3\sqrt{3}cm^2$

18. An angle formed by two chords intersecting with in a circle is 32° and one of the intercepted arcs measures 28°. What is the measure of the other intercepted arc?

A. 64°

C. 60°

B. 36°

D. 30°

19. A candle is made in the form of a circular cylinder of radius 6cm at the bottom and a right circular cone of altitude 4cm. If the overall height is 14cm, what is the volume of the candle?

A. $160\pi cm^3$

C. $400\pi\, cm^3$

B. $408\pi\, cm^3$

D. $360\pi\, cm^3$

20. The area of the upper and lower bases of a frustum of a pyramid is $36\,cm^2 \wedge 64\,cm^2$ respectively.

If the altitude is 4cm, then what is the altitude of the Pyramid?

A. 16cm

C. $10\,cm$

B. 12cm

D. $8\,cm$

21. The inverse of the function $y=2x+3$ is equal to

A. $y=-2x-3$

C. $y=\frac{x-3}{2}$

B. $y=-2x+3$

D. $y=\frac{x+3}{2}$

22. The solution set of $\frac{3x-5}{x^2+4x+3}+\frac{2x+2}{x+3}=\frac{x-1}{x+1}$ is

A. $\{-3,-1,0\}$ C. $\{-3,0\}$

B. $\{-5,0\}$ D. $\{-1,0\}$

23. What is the distance between $p(-3,2)\wedge l:3x+4y-4=0$?

A. $\frac{4}{5}$ C.2

B. $\frac{5}{4}$ D. 1

24. What is the equation of hyperbola with vertices $(-2,0)\wedge(2,0)\wedge asmptote\ y=\pm 3x$?

A. $\frac{x^2}{4}-\frac{y^2}{36}=1$ C. $\frac{y^2}{4}-\frac{x^2}{36}=1$

B. $\frac{x^2}{36}-\frac{y^2}{4}=1$ D. $\frac{y^2}{36}-\frac{x^2}{4}=1$

25. Three statements p, q and r are given by:

P: $6+3\sqrt{3}=9\sqrt{3}$

q: $1+2+3+\ldots+10=56$

r: The prime factorization of 60 is $2^2.3.5$

Then which of the following has a truth value "**False**".

A. $r\Leftrightarrow(\neg p\wedge\neg q)$ C. $\neg q\Rightarrow(p\vee\neg r)$

B. $\neg p\wedge(q\Rightarrow\neg r)$ D. $p\vee(\neg(q\wedge r))$

26. Six people are to sit around a circular table. In how many different ways can these people be seated?

A.720 C. 24

B.120 D. 12

27. Two dice are thrown simultaneously. What is the probability that the sum of the top numbers is 9?

A. $\frac{1}{3}$ C. $\frac{1}{12}$

B. $\frac{1}{6}$ D. $\frac{1}{36}$

28. Let $A be 3 \times 3$ matrix. If $|A| = 4$, then $|3A|$ is equal to

A. 192 C. 48

B. 81 D. 108

29. Let $A = \begin{pmatrix} 4 & 4 & -2 \\ 2 & 6 & 0 \\ 3x & 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 2 \\ 3 & 0 \\ -1 & 5 \end{pmatrix}$ are given $C = AB \wedge C_{32} = 11$, what is the value of x?

A. $\frac{2}{3}$ C. $\frac{-4}{3}$

B. $\frac{-2}{3}$ D. $\frac{3}{5}$

30. What are the modulus and argument of the complex number of $1 + \sqrt{3}i$?

A. $\frac{4 \wedge \pi}{4}$ C. $\frac{\sqrt{3} \wedge -\pi}{3}$

B. $\frac{2 \wedge \pi}{4}$ D. $\frac{2 \wedge \pi}{3}$

31. Which one of the following is the scalar (dot) product of the vectors

$U = 2i - 4j + 6k \wedge V = -2i - j + k$

A. 6 C. 0

B. 8 D. -8

32. Which one of the following is **true** about $f(x) = -5\cos(3x + 2) - 2$?

A. The period is 2π C. The range is $[-7,3]$

B. Amplitude is 2 D. The phase shift is -2.

33. Which of the following is equal to $\cos\left(\sin^{-1}\left(\frac{3}{5}\right)\right)$?

A. $\frac{5}{3}$ C. $\frac{3}{5}$

B. $\frac{4}{5}$ D. $\frac{1}{2}$

34. Which of the following is not an arithmetic sequence?

A. $a_n=5-2n$ C. $a_n=4n+1$

B. $a_n=n^2$ D. $a_n=\frac{5+3n}{2}$

35. What is the partial sum of $\sum_{k=1}^{7} 64\left(\frac{-1}{2}\right)^{k-1}$?

A. -129 C. 43

B. -128 D. 64

36. What is the sum of $\sum_{i=1}^{100} (2i-100)$?

A. 1000 C. 5050

B. 500 D. 100

37. Let the sum of the first n terms of an arithmetic sequence s_n is given by $s_n=4n-n^2$, then the common difference is equal to

A. 2 C. -1

B. -2 D. 1

38. If $\{a_n\}$ is an arithmetic sequence with the first term is 5 and the fifth term is 17, then the partial sum of $\sum_{n=1}^{40} (a_n)$ is equal to

A. 3600 C. 4400

B. 2540 D. 3580

39. The sequence $\{a_n\}, n \geq 1 \text{ where } a_1 = 2 \wedge a_{n+1} = a_n + 4, \text{ then } \sum_{n=3}^{32} \{a_n\}$ is equal to

A.2050 C. 2040

B.3060 D. 4028

40. The sum of infinite series of $2+1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}+\ldots$ is equal to

A.6 C. 4

B.8 D. 3

41. The sum of geometric series of $\sum_{k=1}^{\infty} \left(3^{-1}\sqrt[k]{5}\right)^k$ is _____.

A. $\frac{5}{3}$ C. $\frac{5}{2}$

B. $\frac{1}{2}$ D. $\frac{7}{3}$

42. Let $\{A_n\}$ be an arithmetic progression with $A_{12} = 16$ and $A_{23} = 49$, then what is n^{th} term?

A. $4n+10$ C. $4n-1$

B. $3n-20$ D. $3n-2$

43. How many terms of geometric progression $2, 1, \frac{1}{2}, \ldots$ are needed to give the sum $\frac{511}{128}$?

A.10 C. 8

B.9 D. 7

44. Bontu accepts a position with an initial salary of Birr 18000.00 per year from Nifas Silk Lafto Sub-city Administration Education Bureau. If it is known that her salary will increase at the end of every year by Birr 1500.00, what be her annual salary at the beginning of the eleventh year?

A. Birr 30,000.00 C. Birr 153,000.00

B. Birr 140,000.00 D. Birr 136,000.00

45. A water reservoir is being filled with water at the rate of $4000\,m^3/hr$ for the first hour, $5000\,m^3/hr$ for the second hour, $6000\,m^3/hr$ for the third hour and it increases by $1000\,m^3/hr$ at the end of every hour. It is completely filled in 10 hours. What is the capacity of the reservoir?

A. $60{,}000m^3$ C. $80{,}000m^3$

B. $85{,}000m^3$ D. $170{,}000m^3$

46. If average rate of change of the function $f(x)=kx-9$ over the interval $[3,6]$ is 2, then what is the value of k?

A.3 C. 2

B.4 D. 6

47. What is the gradient of the function $f(x)=2x^2+4x+1$ at $x=3$?

A.31 C. 16

B.12 D. 10

48. If $f(x)=(x^3+2x^2)^{100}$, then $\left.\frac{dy}{dx}\right|x=-1$ is equal to

A.-100 C. 100

B.99 D. -99

49. What is the derivative of $f(x)=\frac{x^2+1}{x^3+x-1}$ at $x=1$?

A.-6 C. -2

B.2 D. 4

50. If the slope of a secant line to the graph of the function $f(x)=px^4+px+2$ over the interval $[1,2]$ is 32, what is the value of p?

A.5 C. 3

B.4 D. 2

51. If the radius r of a hemisphere is increasing at the rate of $3\,cm/sec$, then what is the rate of change of the area when diameter is 4cm?

A. $24\pi\, cm^2/sec$

C. $12\pi\, cm^2/sec$

B. $36\pi\, cm^2/sec$

D. $6\pi\, cm^2/sec$

52. The demand equation for a certain product is $P=8-\frac{1}{2}x$,where x represents the amount of product. What is the level of production which results in maximum revenue?

A. Total revenue of 32 birr

C. Total revenue of 12 birr

B. Total revenue of 64 birr

D. Total revenue of 16 birr

53. A position of a particle is given by equation$S(t)=3t^4-3t+2$ where t is measured in sec and S in meters. Which of the following is **not** true about the motion of the particle?

A. The acceleration of the particle at 1sec is 36 m/sec^2

B. The particle is at rest at $t=0.5\, sec.$

C. The velocity at 2sec is given by 93 m/sec

D. The velocity v at any time is given by $V(t)=12t^3-3$

54. Which one is **not** critical number of the function$f(x)=(x-2)^3(x-1)^3$?

A. 1

C. 0

B. 2

D. $\frac{3}{2}$

55. What is the Area S which is enclosed by the graph of $f(x)=-x^2+4$ and the x-axis?

A.$\frac{32}{3}$

C. $\frac{16}{3}$

B.$\frac{4}{3}$

D. $\frac{8}{3}$

56. The velocity of a moving object is given by the function $v(x)=4x$,where x is in hr and v is in miles per hr. What is the area under the graph which is the distance the object has traveled between the second hour and the fifth hour$(2\le x\le 5)$?

A. the object traveled 50 miles

C. the object traveled 42 miles

B. the object traveled 58 miles

D. the object traveled 30 miles

57. What is the value of $\int_1^{27} x^{\frac{-4}{3}}\,dx$?

A. 8 C. 4

B. 6 D. 2

58. What is the area under the graph of $y=3x^2+4$ over the interval $[-1,3]$?

A. 24 C. 34

B. 44 D. 54

59. Which one is **not** true about $f(x)=x\sqrt{x^2+25}$ at $x=0$?

A. The slope of normal line is $\frac{-1}{5}$ C. Equation of tangent line to the graph is $y=5x$

B. The slope of tangent line is 5 D. Equation of normal line to the graph is $y=-5x$

60. Which one of the following is **not** absolute measure of dispersions?

A. Inter-quartile range C. Coefficient of range

B. Mean deviation D. Standard deviation

61. If $f(x)=x^3+ax+b$ has a relative minimum value of 4 at $x=2$,then the value of **a** and **b** respectively?

A. -12 and 4 C. -12 and 20

B. 4 and 20 D. -8 and 12

62. What is the inter-quartile range of the data sets 25,38,42,46,31,29,21,9,5?

A. 25 C. 34

B. 44 D. 54

63. Given the following data seta.

x	10	20	30	40	50
f	2	4	7	6	1

Then which one is **not** true about the given data

A. The mean of the data set is 30.

B. Mean deviation about the mean is 8.

C. Median of the data set is 30.

D. Median deviation about the mean is 16.

Answer question number 64 and 65 with the given data sets of the following

x	0-5	6-11	12-17	18-23	24-29
f	5	8	7	10	3

64. What is the mode of the data set?

A. 18

B. 19

C. 14

D. 12

65. What is the median of data set?

A. 14

B. 16

C. 24

D. 22