DEPARTMENT OF MATH EMATICS
UNIVERSITY OF BENIN, BENIN CITY
FIRST SEMESTER CONTINUOUS ASSESSMENT TEST 2014/2015 SESSION

MTH110 (ALGEBRA AND TRIGONOMETRY)

CONTINUOUS ASSESSMENT

PLEASE FILL THE SPACE BELOW

NAME (SURNAME FIRST).....

MAT NO.....

DEPARTMENT/SCHOOL.....

ANSWER ALL QUESTIONS. CIRCLE CLEARLY THE APPROPRIATE ANSWER.

1. If one of the roots of the equation $px^2 + qx + r = 0$ is twice the other root, find the relationship relating p, q, and r

A $2qr = 9p$ B $9qr = 2p$ C $9q^2 = 2pr$ D $2q^2 = 9pr$

E None of the above

2. If α and β are the roots of the equation $px^2 + qx + r = 0$ find in terms of p, q, r the values of $\alpha^2 + \beta^2$.

A $\frac{q^2 - 2pr}{p^2}$ B $\frac{-q^2 - 2pr}{p^2}$ C $\frac{q^2 - pr}{p^2}$ D $\frac{2pr - q^2}{p^2}$

E None of the above

3. If α, β are the roots of the equation $3x^2 - 7x - 1 = 0$, find the values of $(\alpha - \beta)^2$

A $\frac{43}{9}$ B $\frac{37}{9}$ C $\frac{55}{9}$ D $\frac{61}{9}$ E None of the above

4. If α, β are the roots of the equation $5x^2 - 3x - 1 = 0$, form the equation with integral coefficient which have the roots $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$

A $25x^2 - 72x - 5 = 0$ B $25x^2 + 72x + 5 = 0$ C $25x^2 + 72x - 5 = 0$

D $25x^2 - 72x + 5 = 0$ E None of the above

5. Find the maximum value of $5 + 6x - x^2$

A 5 B 11 C 14 D 15 E None of the above

6. Find x if $|x + 3| = 2$

A 1, 5 B 1, -5 C -1, -5 D -1, 5 E None of the above

7. Find x if $|x + 3| > 5$

A $x<2,\ x>-8$ B $x>2,\ x<-8$ C $-8<x<2$ D $x<2,\ x<-8$

E None of the above

8. Evaluate u_r for the following sequence 0, 7, 26, 63, 124, ...

A 7(r-1) B $r^2 - 1$ C 7r D $r^3 - 1$ E None of the above

9. Evaluate the first 5 terms of the sequence whose u_r is given as follows

$$\left(-\frac{1}{3}\right)^{r-1}$$

A $-1, \frac{1}{3}, -\frac{1}{9}, \frac{1}{27}, -\frac{1}{81}$ B $-1, -\frac{1}{3}, -\frac{1}{9}, -\frac{1}{27}, -\frac{1}{81}$

C $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}$ D $1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}$ E None of the above

10. The sum of the first n terms of a series is given as $S_n = n^3 - 2n$ for all values of n, find the formula for the rth term

A $3r^2 + 3r + 1$ B $3r^2 + 3r - 1$ C $3r^2 - 3r + 1$ D $3r^2 - 3r - 1$

E None of the above

11. Find the three arithmetic means between -5 and 59.

A 27 B 32 C 11, 27, 43 D 27, 32, 37 E None of the above

12. The second term of a geometric sequence is 24 and the fifth term is 81, find the seventh term.

A $\frac{729}{4}$ B 81 C 729 D $\frac{81}{4}$ E None of the above

13. Evaluate $\sum_{r=1}^{n}(2-3r)$

A $\frac{n(1+3n)}{2}$ B $\frac{n(3n-1)}{2}$ C $\frac{n(1-3n)}{2}$ D $-\frac{n(1-3n)}{2}$

E None of the above

14. The third term of an arithmetic progression is 18 and the seventh term is 30, find the sum of the first thirty three terms

A 1890 B 720 C 1980 D 1800 E None of the above

15. The third term of a geometric sequence is -1 and the seventh term is -81, find the ninth term.

A -729 B 729 C -81 D 81 E None of the above

16. Express $\frac{25-11x}{(x+1)(x-2)(x-3)}$ into partial fraction

A $\frac{2}{x+1}-\frac{3}{x-2}+\frac{1}{x-3}$ B $\frac{3}{x+1}-\frac{1}{x-2}-\frac{2}{x-3}$ C $\frac{3}{x+1}-\frac{1}{x-2}+\frac{2}{x-3}$

D $\frac{3}{x+1}+\frac{1}{x-2}-\frac{2}{x-3}$ E none of the above.

19 Find the values of λ for which the roots of the equation $x^2-(3\lambda+1)x+\lambda^2-1=5\lambda$ are real.

A $\lambda \geq 5 or \lambda \leq \frac{1}{5}$ B $\lambda \leq 5 or \lambda > \frac{1}{5}$ C $\lambda \leq -5 or \lambda \geq -\frac{1}{5}$ D $\lambda \geq -5 or \lambda \leq -\frac{1}{5}$

E None of the above.

21. The operation $*$ on the set of real numbers is defined by $x*y=3x+2y-1, x, y \varepsilon R$. Find the value of x such that $x*2=5$

A 3 B $\frac{5}{2}$ C $\frac{2}{5}$ D $\frac{2}{3}$ E None of the above

26. Find the values of a if the equation $(5a+1)x^2 - 8ax + 3a = 0$ has equal roots.

A 1, 3 B 1, −3 C 0, −3 D 0, 3 E None of the above

27. If one of the roots of the equation $px^2 + qx + r = 0$ is three times the other root, find the relationship relating p, q, and r.

A $3pr = 4q^2$ B $4pr = 3q^2$ C $3pq = 4qr$ D $4pq = 3qr$

E None of the above

28. If α, β are the roots of the equation $5x^2 - 3x - 1 = 0$, form the equation with integral coefficient which have the roots $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$

A $25x^2 - 475x + 1 = 0$ B $5x^2 - 75x + 1 = 0$ C $25x^2 - 475x - 1 = 0$

D $25x^2 - 475x + 1 = 0$ E None of the above

29. Find the minimum value of $12x^2 + 24x + 13$

A 13 B -1 C 1 D -13 E None of the above

30. Find x if $\left|\frac{1}{1+x}\right| = 1$

A 0, −1 B 0, 1 C 1, −2 D 0, −2 E None of the above

31. Find x if $|2x + 3| \leq 1$

A $-2 \leq x \leq 1$ B $-2 \leq x \leq -1$ C $2 \leq x \leq 1$ D $2 \leq x \leq -1$

E None of the above

32. Solve the inequalities $\frac{y+1}{3y-7} > 1$

A $\frac{7}{3} \leq y \leq 4$ B $-\frac{7}{3} \leq y \leq 4$ C $-4 \leq y \leq \frac{7}{3}$ D $-4 \leq y \leq -\frac{7}{3}$

E None of the above

33. Evaluate u_r for the following sequence $\frac{1}{2.3}, \frac{1}{4.5}, \frac{1}{6.7}, \frac{1}{8.9}, \cdots$

A $\frac{1}{2r(2r-1)}$ B $\frac{1}{(r+1)(2r+1)}$ C $\frac{1}{2r(2r+1)}$ D $\frac{1}{(r+1)(2r-1)}$

E None of the above

34. Evaluate the first 5 terms of the sequence whose u_r is given as follows

$2^r + r^2$

A 3, 8, 19, 32, 57 B 3, 8, 17, 32, 59 C 3, 8, 17, 32, 57 D 3, 8, 17, 33, 57

E None of the above

35. The sum of the first n terms of a series is given as $S_n = n^3 - 2n$ for all values of n, find the formula for the rth term

A $3r^2+3r+1$ B $3r^2+3r-1$ C $3r^2-3r+1$ D $3r^2-3r-1$

E None of the above

36. Find three numbers in arithmetic progression whose sum is 3 and the product is −15

A 0, 1, 2 B -1, 3, 5 C 1, 3 -5 D −3, 1, 5 E None of the above

37. Find three arithmetic means between -3 and 13.

A 5 B 9 C 0 D 1, 5, 9 E None of the above

38. The first term of an arithmetic sequence is 7 and the last term is 70 and the sun is 385. Find the common difference

A 7 B 10 C 15 D 20 E None of the above

39. Evaluate $\sum_{r=1}^{n}(5r-7)$ iii)

A $\frac{n(9-5n)}{2}$ B $\frac{n(3n-9)}{2}$ C $\frac{n(5n+9)}{2}$ D $\frac{n(5n-9)}{2}$

E None of the above

40. The third term of a geometric sequence is -1 and the seventh term is -81, find the ninth term.

A -729 B 729 C -81 D 81 E None of the above

41. Express $\frac{x-1}{(x-2)(x-1)^2}$ into partial fraction

A $\frac{3}{x-1}+\frac{3}{x-1}-\frac{2}{(x-1)^2}$ B $\frac{3}{x-1}+\frac{3}{x-1}-\frac{2}{(x-1)^2}$ C $\frac{1}{x-2}+\frac{3}{x-1}-\frac{2}{(x-2)^2}$

D $\frac{3}{x-2}+\frac{3}{x-1}-\frac{2}{(x-2)^2}$ E none of the above.

42. Find the inverse element of 4 under the operation Δ defined on the set of real numbers as $a\Delta b=\frac{ab}{3}$

A $\frac{9}{2}$ B 3 C $\frac{6}{2}$ D $\frac{9}{4}$ E None of the above

46. Find x if $|x+3| = 2$

A 1, 5 B 1, -5 C -1, -5 D -1, 5 E None of the above

47. Find x if $|x+3| > 5$

A $x<2,\ x>-8$ B $x>2,\ x<-8$ C $-8<x<2$ D $x<2,\ x<-8$

E None of the above

48. Find y if $\left|\frac{y-3}{y+1}\right| < 2$

A $y>\frac{1}{3}, y<-5$ B $y<\frac{1}{3}, y>-5$ C $y>-\frac{1}{3}, y<-5$

D $y>\frac{1}{3}, y<5$ E None of the above

49. Evaluate u_r for the following sequence 0, 7, 26, 63, 124, ...

A 7(r-1) B r^2-1 C 7r D r^3-1 E None of the above

50. Evaluate the first 5 terms of the sequence whose u_r is given as follows $\left(-\frac{1}{3}\right)^{r-1}$

A $-1, \frac{1}{3}, -\frac{1}{9}, \frac{1}{27}, -\frac{1}{81}$ B $-1, -\frac{1}{3}, -\frac{1}{9}, -\frac{1}{27}, -\frac{1}{81}$

C $1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}$ D $1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}$ E None of the above

51. The sum of the first n terms of a series is given as $S_n = n^3 - 2n$ for all values of n, find the formula for the rth term

A $3r^2+3r+1$ B $3r^2+3r-1$ C $3r^2-3r+1$ D $3r^2-3r-1$

E None of the above

52. Find the three arithmetic means between -5 and 59.

A 27 B 32 C 11, 27, 43 D 27, 32, 37 E None of the above

53. The second term of a geometric sequence is 24 and the fifth term is 81, find the seventh term.

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54. Evaluate $\sum_{r=1}^{n}(2-3r)$

A $\frac{n(1+3n)}{2}$ B $\frac{n(3n-1)}{2}$ C $\frac{n(1-3n)}{2}$ D $-\frac{n(1-3n)}{2}$

E None of the above

55. The third term of an arithmetic progression is 18 and the seventh term is 30, find the sum of the first thirty three terms

A 1890 B 720 C 1980 D 1800 E None of the above

56. The third term of a geometric sequence is -1 and the seventh term is -81, find the ninth term.

A -729 B 729 C -81 D 81 E None of the above

57. Express $\frac{25-11x}{(x+1)(x-2)(x-3)}$ into partial fraction

A $\frac{2}{x+1}-\frac{3}{x-2}+\frac{1}{x-3}$ B $\frac{3}{x+1}-\frac{1}{x-2}-\frac{2}{x-3}$ C $\frac{3}{x+1}-\frac{1}{x-2}+\frac{2}{x-3}$

D $\frac{3}{x+1}+\frac{1}{x-2}-\frac{2}{x-3}$ E none of the above.

58. Solve the inequalities $3x+12>0$ and $8-4x>0$

A $-2<x<4$ B $-4<x<2$ C $-4<x<-2$

D $-2<x<2$ E None of the above

59. The first term of an arithmetic sequence is 7 and the last term is 70 and the sun is 385. Find the number of terms.

A 7 B 8 C 9 D 10 E None of the above

60. If a and r are both positive, find the sum of the series

$\log ar + \log ar^2 + \log ar^3 + \ldots + \log ar^{n-1}$

A $n\log ar^{\frac{n+1}{2}}$ B $(n-1)\log ar^{\frac{n+1}{2}}$ C $(n+1)\log ar$

D $(n+1)\log ar^{\frac{n+1}{2}}$ E None of the above

61. Evaluate $\sum_{r=1}^{8}(3r+2)$

A $\frac{n(3n+3)}{2}$ B $\frac{n(3n-7)}{2}$ C $\frac{n(3n+7)}{2}$ D $\frac{n(3n-3)}{2}$

E None of the above

62. Evaluate $\sum_{r=1}^{n}(2-3r)$

A $\frac{n(1+3n)}{2}$ B $\frac{n(1-3n)}{2}$ C $\frac{n(3n-1)}{2}$ D $\frac{n(5-3n)}{2}$

E None of the above

63. Find the sum of the first 2n terms of the sequence $5 + 11 + 17 + 23 + \ldots$

A $n(10n+4)$ B $n(12n+4)$ C $n(12n+8)$ D $n(12n-4)$ E None of the above

64. Find the sum of the first 2n terms of the sequence

$a + 3b + 2a + 6b + 3a + 9b + \ldots$

A $n(2n+1)(a+3b)$ B $(2n+1)(a+3b)$ C $n(n+1)(a+3b)$

D $2n(n+1)(a+3b)$ E None of the above

65. The product of three numbers in geometric progression is -64 and their sum is 13, find the second term

A 4 B -4 C $\frac{1}{4}$ D $-\frac{1}{4}$ E None of the above

66. The third term of a geometric sequence is -1 and the seventh term is -81, find the ninth term.

A 729 B -729 C -81 D 81 E None of the above

67. Find the sum to infinity the series $\frac{1}{2}+\frac{1}{3}+\frac{2}{9}+\ldots$

A $1\frac{1}{3}$ B $\frac{3}{2}$ C $1\frac{2}{3}$ D $\frac{2}{3}$ E None of the above

68. Evaluate $1+\sqrt{3}+3+3\sqrt{3}+\ldots+81\sqrt{3}$

A $242\left(1+\sqrt{3}\right)$ B $\frac{242}{1+\sqrt{3}}$ C $121\left(1+\sqrt{3}\right)$ D $-\frac{242}{1+\sqrt{3}}$

E None of the above

69. The first and last term of a geometric progression are 3 and 768 respectively, if the sum of the series is 1533, find common ratio

A 2 B 3 C 4 D 5 E None of the above

70. Find the sum to which the following series converge

$1-x+x^3-x^3+\ldots \quad |x|<1$

A $\frac{1}{1-x}$. B $\frac{1}{1-x^2}$. C $\frac{x}{1-x^2}$. D $\frac{1}{1+x}$. E None of the above

71. Evaluate $\frac{1}{5}+\frac{1}{25}+\frac{1}{125}+\ldots$

A $\frac{5}{4}$. B $\frac{1}{5}$. C $\frac{1}{4}$. D $\frac{4}{5}$. E None of the above

72. Express 0.232323... (*recurring*) as a fraction

A $\frac{23}{100}$ B $\frac{232}{1000}$ C $\frac{2323}{10000}$ D $\frac{23}{99}$ E None of the above

73. Evaluate ${}^{n}C_{r}+{}^{n}C_{r+1}$

A ${}^{n+1}C_{r}$ B ${}^{n}C_{r+1}$ C ${}^{n}C_{r}$ D ${}^{n+1}C_{r+1}$

E None of the above

74. Evaluate ${}^{n}C_{r}+{}^{n}C_{r-1}$

A ${}^{n+1}C_{r}$ B ${}^{n}C_{r+1}$ C ${}^{n}C_{r}$ D ${}^{n+1}C_{r+1}$

E None of the above

PART TWO

30.Expand $(2+x)^5$

A $32+60x^1+60x^2+40x^3+10x^4+x^5$ B $16+80x^1+80x^2+40x^3+10x^4+x^5$

C $32+60x^1+60x^2+30x^3+10x^4+x^5$ D $32+80x^1+80x^2+40x^3+10x^4+x^5$

E None of the above

31. Find the coefficient of x^8 in the expansion of $\left(x^2+\frac{2y}{x}\right)^{10}$

A $210y^4$ B $6300y^4$ C $3360y^4$ D $1360y^4$ E None of the above

32. A box containing 2 yellow and 3 blue cards, in how many ways can 3 cards be chosen if at least one card must be blue

A 9 B 20 C 10 D 6 E None of the above

33. In how many ways can the letters of the word PENCIL be arranged if the arrangement must begin with E and end with P

A 120 B 24 C 60 D 6! E None of the above

34. How many three digit numbers can be formed using the digit 4, 5, 6 if any digit can be used more than once.

A 12 B 18 C 27 D 6 E None of the above

35. In how many ways can the letters of the word CALCULUS be arranged

A 8! B 7! C 6! D 5! E None of the above

36. How many 3 or 4 digit numbers can be formed using the digit 1, 6, 7, 8, 9 if repetition is not allowed?

A 60 B 120 C 180 D 240 E None of the above

40. Find the values of x which satisfy $2x^2-7x+9<x^2-2x+3$

A $x<2,\ x>3$ B $3<x<4$ C $-2<x<3$ D $2<x<3$

E None of the above

41. For what values of x is $\frac{1}{x-3}<1$

A $3<x<4$ B $-3<x<4$ C $x>3,\ x<4$ D $x<3,\ x>4$

E None of the above

42. For what values of x is $\frac{2x-1}{x+3}\le\frac{2}{3}$

A $-3\le x\le\frac{9}{4}$ B $-3\le x\le-\frac{9}{4}$ C $-\frac{9}{4}\le x\le 3$ D $\frac{9}{4}\le x\le 3$

E None of the above

40. Find x if $|x+3|\le 1$

A $-2<x<4$ B $-4<x<2$ C $-4<x<-2$ D $-2<x<2$

E None of the above

41. Resolve the following into partial fractions $\dfrac{6x-10}{x^2-2x-3}$

A $\dfrac{2}{x-3}-\dfrac{4}{x+1}$ B $\dfrac{2}{x+3}+\dfrac{4}{x-1}$ C $\dfrac{2}{x-3}+\dfrac{4}{x+1}$

D $\dfrac{2}{x-3}-\dfrac{4}{x-1}$ E None of the above

42. Resolve the following into partial fractions $\dfrac{x^3-x^2-4}{x^2-1}$

A $\dfrac{3}{x+1}-\dfrac{2}{x-1}$ B $x-1+\dfrac{3}{x+1}-\dfrac{2}{x-1}$ C $x-1-\dfrac{3}{x+1}-\dfrac{2}{x-1}$

D $x-1-\dfrac{3}{x+1}+\dfrac{2}{x-1}$ E None of the above

43. Resolve the following into partial fractions $\dfrac{x^2+4x-7}{(x+1)(x^2+4)}$

A $\dfrac{x-7}{(x^2+4)}-\dfrac{1}{x+1}$ B $\dfrac{3x-1}{(x^2+4)}+\dfrac{2}{x+1}$ C $\dfrac{x+1}{(x^2+4)}+\dfrac{2}{x+1}$

D $\dfrac{3x+7}{(x^2+4)}-\dfrac{1}{x+1}$ E None of the above

44. Resolve the following into partial fractions $\dfrac{x^2}{(x+1)^3}$

A $\dfrac{1}{x+1}-\dfrac{2}{(x+1)^2}+\dfrac{1}{(x+1)^3}$ B $\dfrac{1}{x+1}+\dfrac{1}{(x+1)^2}+\dfrac{1}{(x+1)^3}$

C $\dfrac{1}{x+1}-\dfrac{2}{(x+1)^2}-\dfrac{1}{(x+1)^3}$ D $\dfrac{1}{x+1}+\dfrac{2}{(x+1)^2}-\dfrac{1}{(x+1)^3}$

45. Resolve the following into partial fractions $\dfrac{4x+11}{(x^2+4x-5)}$

A $\dfrac{1}{2}\left(\dfrac{3}{x+5}-\dfrac{5}{x-1}\right)$ B $\dfrac{1}{2}\left(\dfrac{3}{x-5}+\dfrac{5}{x+1}\right)$

C $\dfrac{1}{2}\left(\dfrac{3}{x-5}+\dfrac{5}{x-1}\right)$ D $\dfrac{1}{2}\left(\dfrac{3}{x+5}+\dfrac{5}{x-1}\right)$ E None of the above

46. Resolve the following into partial fractions $\dfrac{x^2+2}{(2x+1)(x^2+2x+3)}$

A $\dfrac{1}{2x+1}-\dfrac{1}{x^2+2x+3}$ B $\dfrac{1}{2x+1}+\dfrac{1}{x^2+2x+3}$

C $\dfrac{1}{2x+1}-\dfrac{3}{x^2+2x+3}$ D $\dfrac{1}{2x+1}-\dfrac{4}{x^2+2x+3}$ E None of the above

47. Resolve the following into partial fractions $\dfrac{7x+2}{(2x-3)(x+1)^2}$

A $\frac{2}{2x-3}-\frac{1}{x+1}-\frac{1}{(x+1)^2}$ B $\frac{2}{2x-3}+\frac{1}{x+1}+\frac{1}{(x+1)^2}$

C $\frac{2}{2x-3}+\frac{1}{x+1}-\frac{1}{(x+1)^2}$ D $\frac{2}{2x-3}-\frac{1}{x+1}+\frac{1}{(x+1)^2}$

E None of the above

49. Determine n and r if ${}^{n}P_{r} = \frac{10!}{4!}$

A $n=10,\ r=4$ B $n=10,\ r=6$ C $\therefore n=6,\ r=4$ D $n=10,\ r=10$

E None of the above

49. How many 4 digit even numbers can be formed using the digit 1, 6, 7, 8, 9 if repetition is not allowed?

A 80 B 120 C 60 D 48 E None of the above

50. A committee of three boys and 4 girls is to be formed from5 boys and 6 girls, how many committees are possible?

A 420 B 60 C 25 D 360 E None of the above