1B3N16204 (Pages :2) Reg. No:…………………………..

Name: ……………………………

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester BSc Degree Examination, November 2016

MAT3B03 - Calculus and Analytic Geometry

(2015 Admission onwards)

Max. Time: 3 hours Max. Marks: 80

Part – A

Answer all the twelve questions, Each question carries 1 mark.

1. Give a simpler expression for $e^{\ln(x^2+y^2)}$
2. What is the domain of the Natural Logarithms, In (X) ?
3. What is the derivative of a^x
4. What is the n^{th} term test for the divergence of a series ?
5. Find $\lim_{x\to\frac{\pi}{2}}\left(\frac{\sec x}{1+\tan x}\right)$
6. State whether the Series $1-\frac{1}{4}+\frac{1}{9}-\frac{1}{16}+\frac{1}{25}-$ .... is Conditionally Convergent or absolutely Convergent ?
7. What is the eccentricity of the conic $2x^2+y^2=4$
8. Identify the Conic $3x^2-7xy+\sqrt{17}y^2=1$
9. What is the Formula to find the area of the surface generated by revolving the Curve $x=f(t)$, $y=g(t)$, $a\le t\le b$ about x – axis
10. What is the Cartesian equivalent of the polar equation $r\sin(\theta)=0$
11. Write the Taylor – Series of $F(x)=e^x$ at $x=0$
12. What is the eccentricity of parabola?

(12 x 1 = 12marks)

Part – B

Answer any nine questions

Each question carries 2 marks

13. Express $\ln\sqrt{13.5}$ interms of In2 and In3
14. Find $\frac{dy}{dx}$ if $\ln y = e^y \sin x$
15. Find $\lim_{x\to 0}\frac{\sin x-x}{x^3}$
16. State Sandwich theorem for sequences and use it to show that the sequence $\left\{\frac{\cos n}{n}\right\}\to 0$
17. Find the sum of the series $\frac{1}{8}+\frac{1}{16}+\frac{1}{32}+\ \dots\dots\dots$
18. Find the sum of the telescoping series $\sum_{n=1}^{\infty}\frac{4}{(4n-3).(4n+1)}$
19. Find $\frac{d^2y}{dx^2}$ if $x = a\sec t,\ y = b\tan t$
20. The parabola $y^2=8x$ is shifted down 2 units and right 1 unit, without changing the direction of axes. Find the equation, Foci and vertices of the new parabola.
21. Identify the Particle's path by finding a Cartesian equation and graph if for the parametrized curve $x=\sin(2\pi(1-t))$, $Y=\cos(2\pi(1-t))$), $0\le t\le 1$
22. Show that the Series $\sum_{n=1}^{\infty}\frac{n+1}{n}$ diverges
23. Check the convergence of the series $\sum_{n=1}^{\infty}\frac{n^{10}}{10^n}$
24. Find the Taylor series of $f(x)=\cos x$ at $x=0$.

(9 x 2 = 18 marks)

Part – C

Answer any six questions

Each question carries 5 marks

Drop a ball from 'a' meters above a flat surface. Each time the ball hits the surface after falling a distance h, it rebounds a distance rh, where r is positive but less than 1. Find the total distance the travels up and down.

Find $\lim_{x\to 0}\left(\frac{1}{\sin x}-\frac{1}{x}\right)$

Find $\frac{dy}{dx}$ if $y=\sqrt{\frac{(x+1)^{10}}{(2x+1)^5}}$

Check the convergence of the series $\sum_{n=1}^{\infty}\frac{(n+3)!}{3!n!\,3^n}$

Show that the Maclaurin series for $\sin x$ converges to $\sin x$ for all x.

The ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ is shifted 4 units to the left and 1 units down .Find the new equation, foci, centre, vertices and eccentricity.

Find the Centre, Foci, vertices and axis of the conic $2x^2-y^2+6y=3$

Show that $\frac{d^2y}{dx^2}=\frac{-1}{4a}\cos^4\left({}^t/_2\right)$ for the cycloid $x = a(t-\sin t), y = a(1-\cos t)$

Find the Cartesian equation Corresponding to the Polar equation $r\sin\left(\theta+\frac{\pi}{4}\right)=\sqrt{2}$

(6x5 = 30 marks

Part D

Answer any two questions

Each question carries 10 marks

a) Show that $\lim_{x\to 0^+}(1+x)^{1/x}=e$

b) Find the area of the surface swept out by revolving the circle $x=\cos t$, $y=1+\sin t$, $0\le t\le$ about the x-axis. Also find $\frac{dy}{dx}$ and $\frac{d^2y}{dn^2}$

a) Investigate the convergence of $\sum_{n=1}^{\infty}\frac{4^n.n!.n!}{(2n)!}$

b) Show that the P-series $\sum_{n=1}^{\infty}\frac{1}{n^p}$ converges if p> 1 and diverges if p≤ 1

(a) Find $\lim_{x\to\infty}x^{1/x}$

(b) Solve For x : $3^{\log_3(x^2)}=5.\,e^{\ln x}-3.\,10^{\log_{10}(2)}$

A) Find the Cartesian equation for the hyperbola centered at the origin that has focus at (4,0) and line x=2 as the corresponding directrix

b) Find the polar equation corresponding to the Cartesian equation $x^2+4x+y^2+2y=0$

(2x10 = 20 mar

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester BSc Degree Examination, November 2016

MAT3C03 - Mathematics

(2015 Admission onwards)

Max. Time: 3 hours Max. Marks: 80

Part A (Objective Type Questions)

Answer **all** questions

1. Order and degree of the differential equation $y'' + 2(y')^2 + 3 = 0$ is ……….and ………..
2. Solution of the differential equation $y' = x/y$.
3. Write the general form of Bernoulli's differential equation.
4. What is the rank of 3×3 unit matrix?
5. The system of equations AX = B is consistent if………
6. Give an eigen value of the matrix A^T ,given 3 is an eigen value of the matrix A.
7. Find the eigen values of the matrix $\begin{bmatrix} 1 & 0 \\ 0 & 3 \end{bmatrix}$.
8. Find a unit vector in the direction of the vector **i** +3**j** +2**k**.
9. Write the parametric equation of $(x-1)^2 + y^2 = 9$
10. A vecor **V** is solinoidal if …………
11. Find gradF where $F(x,y,z) = x^2 + y^2 + z^2$
12. What you mean by singular solution of a differential equation.

(12× 1 = 12 *marks*)

Part B(Short Answer Type Questions)

Answer any **nine** Questions

13. Solve the differential equation $y' = (1+x)(1+y^2)$.
14. Show that the differential equation $(3x^2y + e^y)\,dx + (x^3 + x\,e^y - 2y)dy$ is exact and hence solve it.
15. Solve $y' + y\tan x = \cos^3 x$.
16. Find the orthogonal trajectories of the family of parabolas $y = kx^2$.
17. Find the eigen values of the matrix $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & -1 \end{bmatrix}$.
18. Find the rank of matrix $\begin{bmatrix} 2 & 4 & 1 \\ 3 & 2 & 1 \\ 3 & 1 & 5 \end{bmatrix}$.
19. Test for the consistency of the system of equations x+y = 3, x+2y=4, x + 4y =6.
20. Prove that eigen values of a diagonal matrix is the diagonal elements.
21. Find the angle between the planes x+y+z =1 , x+2y+3z = 6.
22. Find the legth of the semi cubical parabola $\mathbf{r}(t) = t\,\mathbf{i} + t^{3/2}\,\mathbf{j}$ t=0 to t=1.
23. Find the directional derivative of $f(x,y,z) = 2xy + z^2$ in the direction of **i** +2 **j** +2 **k** at the point (1, -1, 3).
24. Find div f ,where $f(x,y,z) = (3x^2y - y^3z^2)\,\mathbf{i} - 3z\,\mathbf{k}$ at the point (1,1,2)

(9× 2 =18 marks)

Part C (Short Essay Questions)

Answer any **six** questions

25. Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)\,dy = 0$.
26. Solve $y' + x\sin x = x^3\cos^2 y$.
27. Rduce to the normal form and hence find the rank of the matrix $\begin{pmatrix} 1 & 6 & -18 \\ -4 & 0 & 5 \\ -3 & 6 & -13 \end{pmatrix}$.
28. Find the condition that the system of equations 3x+4y+ 5z= a, 4x + 5z+ 6z= b, 5x + 6y + 7z= c is consistent.
29. Find the eigen vector corresponding to the least eigen value of the matrix $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$.
30. Use Cayley Hamilton theorem to find A^3 and A^{-1} if $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$.
31. If **a** is a constant vector and **r** = x **i** + y **j** + z **k** . Show that curl (**a**×**r**) = 2**a**.
32. **F**=xy **i** +x^2 **j** . Evaluate $\int_c \boldsymbol{F}.\boldsymbol{dr}$,where c is the quarter circle from (2,0) to (0,2) with centre as origin.
33. Show that the integral $\int_c 3x^2dx + 2yz\,dy + y^2dz$ is independent of path and hence solve the integral from (0,1,2) to (1,-1,7).

(6× 5= 30 marks)

Part D (Essay Type Questions)

Answer any **Two** Questions

34. a) Solve the differential equation $(x^2 - 2x + 2y^2)\,dx + 2xy\,dy = 0$
    b)Show that $V = (y^2 + 2xz^2 - 1)\mathbf{i} + (2xy)\,\mathbf{j} + (2xz^2)\mathbf{k}$ is irrotational.
35. Let $A = \begin{bmatrix} 6 & -2 & -2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$, Find
    a)Eigen values and corresponding eigen vectors of A
    b) Use Cayley Hamilton theorem to find A^{-1}
36. Verify Gauss's divergence theorem for **F** , where $\mathbf{F} = (x^2 - yz)\,\mathbf{i} + (y^2 - zx)\,\mathbf{j} + (z^2 - xy)\,\mathbf{k}$ over the rectangular parallelepiped $0 \le x \le 1$, $0 \le y \le 2$, $0 \le z \le 3$.

(2×10=20 marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2016

A11 - Basic Numerical Skills

(2015 Admission onwards)

Max. Time: 3 hours Max. Marks: 80

Part I

Answer **all** questions in this part.
Each question carries 1 mark

Choose the correct answer from the choice given:

1. The distance of the point P(-3 , 4) from the origin is:
   (a) 3 (b) 4
   (b) 5 (d) 7
2. The equation y=2x+5 has:
   (a) No Solution (b) One Solution
   (c) Three Solutions (d) Infinity many Solutions
3. The point of intersection of the 'less than' and 'more than' 0 given corresponds to:
   (a) Mean (b) Median
   (c) Geometric Mean (d) Harmonic Mean
4. The best average to analyze speed is:
   (a) Mode (b) Arithmetic Mean
   (c) Geometric Mean (d) Harmonic Mean
5. Which of the following statement is true:
   (a) 0 ∈ {} (b) 0 ⊂ {}
   (c) 0 ∈ {0} (d) 0 ⊂ {0}

Fill in the blanks:-

6. The geometric mean between *a* and *b* is ____________.
7. Measures of dispersion are called averages of the _________ order.
8. Condition for the matrix A to be symmetric is ___________.
9. ___________ is the graphical method of studying dispersion.

10. The 6th term of $\frac{3}{7}, \frac{3}{8}, \frac{3}{8}, \frac{3}{9}$ is ___________.

(10 × 1 = 10 marks)

Part II

Answer **any** eight questions.
Each question carries 2 marks.

11. Solve x + y = 10 and xy = 24.

12. Define Power set. If set S is infinite set of 'n' elements, how many elements are in the power set?

13. A = { x : x is natural number satisfy 1 < x < 6}
    B = { x : x is natural number satisfy 6 < x < 10}
    Find A ∪ B and A ∩ B

14. If the 5^{th} and 10^{th} terms of G.P are 32 and 1024 respectively, find the first term and the common ratio?

15. Let $P = \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$, $Q = \begin{bmatrix} -1 & 2 \\ 4 & 3 \end{bmatrix}$ and $R = \begin{bmatrix} 2 & -1 \\ 6 & 5 \end{bmatrix}$ Find P(Q+R) and PQ+PR, Hence prove P (Q + R) = PQ +PR.

16. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ -1 & 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 & -1 \\ 1 & 3 & 4 \\ 0 & -2 & -3 \end{pmatrix}$ Show that AB ≠ BA.

17. Prove that A ∩ (A ∪ B) = A ∪ (A ∩ B) by means of Venn diagram.

18. Define Skewness. And Positive Skewness and Negative Skewness?

19. Find the first four central moments for the value given below:
    8, 10 , 12, 7 , 18 . Find coefficient of Skewness and measure of Kurtosis.

20. Define consumer price index number?

(8 × 2 = 16 marks)

Part III

Answer **any** six questions.
Each question carries 4 marks

21. Solve the system of equations :
    9x = 3y – 4z =35, x + y – z = 4, 2x – 5y – 4z +48 = 0

22. A club consist of members whose ages in A.P, the common difference being 3 months. If the youngest member of the club is 7 years old and the sum of the ages of all the members is 250 years, find the number of members in the Club?

23. Explain the components given below?
    a) Line Diagram
    b) Bar Diagram
    c) Pie Diagram (Pie Charts)
    d) Histogram

24. Find the Quartile measure of dispersion and its coefficient for the data given below.

Age:	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No of Person:	15	30	53	75	100	110	115	125.

25. If $A = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ -1 & 1 & 2 \end{pmatrix}$ Where *f(x)* is given by $f(x) = x^2 - 5x - 6$.

26. A man deposits a certain sum of money into bank. It amounts to Rs.12325 in 8 years and amount to Rs.13565 in 10 years. Find the sum invested.

27. What are the important functions of Statistics? Explain them.

28. Find the inverse of the matrix $A = \begin{pmatrix} 0 & 6 & 7 \\ 0 & 2 & 1 \\ -2 & 3 & 4 \end{pmatrix}$

(6 × 4 = 24 marks)

Part IV

Answer **any** two questions.
Each question carries 15 marks

29. Solve the system of equations with the help of matrices.
    2x – 2y + z =1
    x + 2y + 2z = 2
    2x + y -2z = 7

30. Compute the trend values by the method of least squares from the data given below. Also estimate the Number of sheep in 2009.

Year:	2002	2003	2004	2005	2006	2007	2008	2009
No. of Sheep:	56	55	51	47	42	38	35	32.

31. Explain any *four* methods of random (probability) sampling.

(15 × 2 = 30)