First Year
Mathematics
ELEMENTS OF CALCULUS

Time : 3 hours  Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)

Answer any FIVE questions.

1. Find the $n^{th}$ differential co-efficient of $\cos x \cos 2x \cos 3x$.

2. Find the maximum value of function $f(x, y) = xy(a - x - y)$.

3. Find the radius of curvature at the point '$t$' of the curve $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$.

4. Evaluate $\int_{0}^{\pi/2} \sin^7 \theta \cos^5 \theta \, d\theta$.

5. Find the area of the cardioid $r = a(1 + \cos \theta)$.
6. If \( \{s_n\} \) is a sequence of non-negative numbers and if \( \lim_{n \to \infty} s_n = L \), then \( L \geq 0 \).

7. Prove \( \lim_{n \to \infty} \frac{3n^2 - 6n}{5n^2 + 4} = \frac{3}{5} \).

8. Show that the series \( \sum_{n=1}^{\infty} \frac{2n}{n^2 - 4n + 7} \) diverges.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE questions.

9. If \( y = \left( x + \sqrt{1 + x^2} \right)^m \), prove that

\[
(1 + x^2)y_{n+2} + (2n + 1)xy_{n+1} + (n^2 - m^2)y_n = 0.
\]

10. (a) If \( u = \frac{xy}{x + y} \), show that \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = u \).

(b) \( u = \tan^{-1} \frac{x^3 + y^3}{x - y} \), prove that

\[
x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u.
\]

11. Find the evolute of the ellipse \( \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \).
12. Prove that the radius of curvature at a point
\((a \cos^3 \theta, a \sin^3 \theta)\) on the curve \(x^{2/3} + y^{2/3} = a^{2/3}\) is
\(3a \sin \theta \cos \theta\).

13. Find the length of one loop of the curve
\(3ay^2 = x(x - a)^2\).

14. Establish the reduction formula for \(\int \sin^n x \, dx\) and
hence evaluate \(\int_0^{\pi/2} \sin^6 x \, dx\).

15. Prove that the sequence \(\left\{ \left(1 + \frac{1}{n}\right)^n \right\}_{n=1}^\infty\) is
convergent.

16. If \(\{s_n\}\) is a sequence of real number which
converges to \(L\) then show that \(\left\{s_n^2 \right\}_{n=1}^\infty\) converges
to \(L^2\).
U.G. DEGREE EXAMINATION –
JUNE 2018.
First Year
Mathematics
TRIGNOMETRY, ANALYTICAL GEOMETRY
(3D) AND VECTOR CALCULUS

Time : 3 hours            Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)
Answer any FIVE questions.

1. Express \( \cos 6\theta \) in terms of \( \cos \theta \).

2. Prove that \( \cosh^{-1} x = \log \left[ x + \sqrt{x^2 - 1} \right] \).

3. Prove that the planes \( x + 2y + 2z = 0 \),
   \( 2x + y - 2z = 0 \) are right angles.

4. Find the equation of the plane parallel to \( 2x - 3y + 5z + 12 = 0 \) and passing through the points \( (2, 3, 1) \).
5. Find centre and radius of the sphere 
\[16x^2 + 16y^2 + 16z^2 - 16x - 8y - 16z - 55 = 0.\]

6. Find the equation of the sphere with centre 
(1, –1, 2) and touching the plane \(2x - 2y + z = 3\).

7. If \(\phi = x^2 + y^2 - z - 1\) find \(\text{grad } \phi\) at (1, 0, 0).

8. If \(\vec{F} = x^2\hat{i} + xy\hat{j}\) evaluate \(\int_C \vec{F} \cdot d\vec{r}\) from (0, 0) to 
(1, 1) along the line \(y = x\).

SECTION B — (5 \times 10 = 50 marks)

Answer any FIVE questions.

9. Prove that \(\cos^8 \theta = \frac{1}{2^7}[\cos 8\theta + 8\cos 6\theta + 28\cos 4\theta +
56\cos 2\theta + 35].\)

10. Find \(\log(1 + i)\).

11. Find the equation of the plane passes through the 
intersection of the planes \(2x + 3y + 10z - 8 = 0\)
\(2x - 3y + 7z - 2 = 0\) and is perpendicular to the 
plane \(3x - 2y + 4z - 5 = 0\).

12. Find the image of the point (2, 3, 5) in the plane 
\(2x + y - z + 2 = 0\).
13. Obtain the equation of the plane passing through the points (2, 2, –1), (3, 4, 2) and (7, 0, 6).

14. Find the shortest distance between the lines

\[
\frac{x - 8}{3} = \frac{y + 9}{16} = \frac{z - 10}{7} \quad \text{and} \quad \frac{x - 15}{3} = \frac{y - 29}{8} = \frac{z - 15}{-5}.
\]

15. Find the equation of the sphere which pass through the circle \( x^2 + y^2 + z^2 = 5 \), \( x + 2y + 3z = 5 \) and touch the plane \( 4x + 3y = 15 \).

16. Find \( \nabla \cdot \vec{F} \) and \( \nabla \times \vec{F} \) of the vector point function \( \vec{F} = xz^3 \hat{i} - 2x^2yz \hat{j} + 2yz^4 \hat{k} \) at the point (1, –1, 1).
B.Sc. DEGREE EXAMINATION –
JUNE, 2018.

First Year

Mathematics with Computer Applications

COMPUTER FUNDAMENTALS AND PC SOFTWARE

Time : 3 hours Maximum marks : 75

SECTION A — (5 × 5 = 25 marks)

Answer any FIVE of the following.

1. Write a short note on magnetic memory.
2. Distinguish between system software and application software.
3. How do you add and remove programs in the start menu?
4. How do you set a screen server with password?
5. Explain installing and uninstalling programs in MS-Windows.
7. What are the main advantages of find and replace in MS-Word?

8. What are the steps involved in a slide show using power point.

SECTION B — (5 × 10 = 50 marks)

Answer any FIVE of the following.

9. Draw the block diagram of a computer and explain.

10. Explain virus protection and cure in detail.


12. Write a short note on disc fragmentation and disk cleanup.


14. Explain varies proofing tools that are available in Microsoft Word.

15. Write down the steps for creating mail-merge in a word document.

16. Explain various components of power point.