**DEPARTMENT OF MATHEMATICS**

**COURSE : BE (MARINE, PE, NA, HE, EEE, MECH, MINING, FOOD TECH)**

**SUBJECT : ENGINEERING MATHEMATICS – I**

**COURSE CODE: UBMTCO1**

**SEMESTER: I**

**unit-I**

**THREE DIMENSIONAL ANALYTICAL GEOMETRY**

**PART-A**

1. Find centre and radius of the 
2. Find the equation of the sphere whose centre is (1,-2, 4) and radius 5.
3. Find the equation of the sphere whose centre is (2,-2, 5) and radius 10.
4. Find the equation of the sphere whose centre is (-1,0, 4) and radius 4.
5. The lines and coplanar or not?
6. Find the equation of the sphere whose end points of the diameters are (1, 1, 0), (1, 2, 1).
7. Find the equation of the plane passing through (2, 1, 1), (-2, 7, 8) and (-4, 2, -1).
8. Find the angle between the planes and x+y+2z=7.
9. Find the equation of the cone with vertex at origin and guiding curve
10. Find the equation of the plane passing through (1, 1, 0), (1, 2, 1) and (-2, 2, -1).
11. Find the equation of the plane through (2, 3, -4) and (1,-1, 3) and parallel to the x-axis.
12. Find the equation of the plane which passes through the point (3, -2, 4) and is perpendicular to the line joining the points (2, 3, 5) and (1, -2, 3).
13. Find the equation of the plane which passes through the point (1,-2, 1) and is perpendicular to each of the planes and x-2y+z+4=0.
14. Find the angle between the planes and x+y+2z=7.
15. Find the direction cosines of the line .
16. Find the shortest distance between the lines and Are they coplanar?
17. Find the magnitude of the shortest distance between the lines  and 
18. Find the equation of the sphere passing through the points (0,0,0), (1,0,0),(0,1,0) and (0,0,1).
19. Find the equation of the sphere with centre (1,-1, 2) and radius 3.
20. Find the coplanar between the lines  and 
21. Find the value of k so that the lines = and = may be perpendicular to each other
22. Find in symmetrical form the equations of the line given by .
23. Find the equation of the cone whose vertex is (1,2,3) and the guiding curve is the circle
24. Find the equation of the right circular cylinder of radius 2 whose axis is the line
25. Find the equation of the sphere passing through the points (1, 1,-2), (-1,1,2) and having the centre of the sphere on the line x+y-z-1=0=2x-y+z-2.

**PART B**

1. The equation of the surface of sphere is .Find its volume.
2. Find the equation of the surface of sphere passing through the circle is &  through the origin.
3. Find the equation of the plane through the line and parallel to the line .
4. Show that the plane touches the sphere

1. Find the equation of the sphere passing through the circle

 and through the origin.

1. Show that the spheres and intersect at right angles. Find their plane of intersection.
2. Show that the plane touches the sphere and find the point of contact.
3. Find the equation of the right circular cylinder of radius 3 and axis .
4. Find the shortest distance and the equation of the line of shortest distance between the straight lines
5. Find the shortest distance and the equation of the line of shortest distance in synnetrical form of the lines and .
6. Find the centre and radius of the sphere
7. Find the equation of the plane containing the point (-1,7,2) and the line
8. Show that the lines and are coplanar and find equation of the plane containing them.
9. Prove that the lines and are parallel
10. Find the equation of the plane passing through (2, 2, 1) and (9, 3, 6) and perpendicular to the plane

**PART-C**

1. Find the equation of the sphere which passes through the points (0,-2,-4), (2,-1,-1) and whose centre lies on the line
2. Find the equation of the sphere whose centre is (6,-1,2) and which touches the plane
3. Show that the spheres  ,  intersect at right angles .Find their plane of intersection.
4. Find the equation of the sphere that passes through the circle, & cuts orthogonally the sphere 
5. Find the equation of tangent plane at the  on the sphere 
6. Find the equation of the cone with vertex  & which passes through the curve ,
7. Find the equation of the cone with vertex at origin & which passes through the curve ,
8. Find the equation of the cylinder having axis  & guiding curve ;.
9. Find the equation of the cylinder whose generating lines have direction cosines  & which pass through the circumference of the circle  in the  plane.
10. Find the equation of the sphere for which the circle is a great circle.

**UNIT-II**

**differential calculus**

**Part-A**

1. Find when x and y are connected by the relation.
2. Resolve  into partial fractions.
3. If  find 
4. If , find .
5. Find the nth derivatives of
6. Find the nth derivatives of 
7. Find the nth derivatives of
8. If , Find 
9. If , Find 
10. Differentiate: with respect to *x*.
11. Differentiate: with respect to *x*.
12. Differentiate: with respect to *x*.
13. 



1. Differentiate: with respect to *x*
2. Find if =
3. Evaluate:
4. Evaluate:
5. Evaluate:
6. Evaluate:
7. Evaluate:
8. Find Maclaurin's series for *f* (x) =
9. Find Maclaurin's series for *f* (x) =
10. Find Maclaurin's series for *f* (x) =
11. State: Taylor’s series expansion of *f* (x) about x = a.

**Part-B**

1. Find the nth derivative of .
2. Expand  by Maclaurin’s series.
3. Expand  in the powers of  using Taylor’s series.
4. Evaluate: .
5. Prove that , .
6. Evaluate: 
7. Find 
8. Expand  by Maclaurin’s series.
9. Using Taylor’s series, Expand.
10. Evaluate: .
11. Evaluate: .
12. Evaluate: .
13. If *y* = sin *x* sin 2*x* sin3*x*, find  *yn*
14. If y , find  *yn*
15. Find the nth derivative of

**Part-C**

1. If , Show that  and hence Prove that

 = 0

2. If y = ,Prove that = and hence show that

 = 0

 3 . If y = , Prove that = and hence show that

 = 0

 4. If y = , using by Leibnitz's rule Prove that

 = 0

5**.** Evaluate: 

6. Evaluate: 

7. Find the values of a and b such that .

8. Evaluate: 

9. If y = a cos log x + b sin log x using by Leibnitz's rule Prove that

 = 0

10. , Show that  and hence prove that

 = 0

**UNIT-III**

**FUNCTIONS OF SEVERAL VARIABLES**

PART-A

1. Evaluate 
2. If , Show that .
3. Find the critical points of .
4. Find the saddle points of .
5. If , Find 
6. Prove that  satisfies  where  and  are assumed to be at least twice differentiable and ‘a’ is any constant.
7. Verify Euler’s theorem (a)  (b) .
8. If , show that .
9. Find  if  where  and .
10. If , , , Find .
11. If  and . Find.
12. If  where Find 
13. IF , show that .
14. If , Find 
15. If , where , , Find .
16. Find the total differential of the function  of three variable x,y,z
17. If , , , Find .
18. Find , if where 
19. Find , if 
20.  where ,
21. Find , if .
22. If where  , 
23. If , Find .
24. Find the critical points of 
25. Find the order and degree of the differential equation

 a) 

 b) 

**Part B**

1. If , find the value of .
2. IF , show that .
3. If , Show that .
4. If , Show that .
5. If , Show that .
6. If , show that .
7. If , Show that .
8. Find  and , if .
9. If , P.T..
10. Find the minimum value of subject to the condition 
11. If , P.T..
12. IF , show that .
13. If where prove that 
14. If where prove that 
15. If  and. Find  as a total

derivative and verify the result by direct substitution.

**PART-C**

1. If , show that .
2. If , Prove that .
3. If u = f(r) where , S.T..
4. Find the maximum and minimum value of .
5. Find the maximum and minimum values of .
6. If , Show that .
7. A rectangular box open at the top is to have volume32cc. Find the dimension of box requiring least material for its construction.
8. If , Prove that .
9. If , the find the value of  which will make .
10. Find the minimum value of subject to the condition 

UNIT-IV

**integral calculus-I**

**PART-A**

1. Evaluate : 
2. Evaluate : 
3. Evaluate : 
4. Evaluate : 
5. Evaluate : 
6. Evaluate : 
7. Evaluate : 
8. Evaluate : 
9. Evaluate : 
10. Evaluate : 
11. Evaluate : .
12. valuate : 
13. Evaluate : 
14. Evaluate : .
15. Evaluate : .
16. Evaluate : .
17. Evaluate : 
18. Evaluate : 
19. Evaluate : 
20. Write any two Reduction formulas
21. Evaluate : 
22. Evaluate : 
23. Evaluate : 
24. Write any two properties of Definite integral
25. Define Beta and Gamma function

**PART B**

1. Evaluate : .
2. Evaluate : .
3. Evaluate : .
4. Evaluate : .
5. Evaluate : .
6. Evaluate : .
7. Evaluate :
8. Evaluate : 
9. Evaluate : .
10. Evaluate : 
11. Evaluate : 
12. Evaluate : 
13. Evaluate : 
14. Evaluate : 
15. 

**PART-C**

1. Evaluate (i) (ii)
2. Evaluate :
3. Evaluate :
4. Evaluate :
5. Evaluate : 
6. Prove that 
7. Evaluate : (i)  (ii) Evaluate : 
8. Define  integral & P.T 
9. Find the area of the loop of the curve .
10. Show that the area included between the cardiods  and 

 **UNIT-V**

**integral calculus-II**

**PART-A**

1. Evaluate :
2. Evaluate 
3. Evaluate :
4. Evaluate :
5. Evaluate :
6. Evaluate :
7. Evaluate :
8. Evaluate :
9. Evaluate :
10. Evaluate :
11. Evaluate :
12. Evaluate :
13. Evaluate :
14. Evaluate 
15. Evaluate :
16. Evaluate :
17. Evaluate :
18. Change the order of integration in 
19. Evaluate :
20. Evaluate :
21. Evaluate :
22. Evaluate : 
23. Evaluate :
24. Evaluate :
25. Evaluate  over the region bounded by 

**PART B**

1. Evaluate :
2. Evaluate :
3. Evaluate :
4. Evaluate :
5. Evaluate :
6. Evaluate :
7. Evaluate :
8. Evaluate :
9. Evaluate :
10. Evaluate :
11. Evaluate :
12. Evaluate :
13. Evaluate :
14. Evaluate :
15. Evaluate :

**PART-C**

1. Evaluate :
2. Evaluate 
3. Evaluate 
4. Evaluate :
5. Evaluate: using change of order of integration.
6. Transform the following into Cartesian form and hence evaluate .
7. Evaluate :
8. Find the area bounded by the parabola  by double integration.
9. Find the volume of the tetrahedron bounded by the co-ordinate plane an 
10. Find the volume of the sphere of radius ‘a’ by triple integrals

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