University Institute of Engineering and Technology, CSJM University, Kanpur

Mathematics I MTH-S101 (CHE)

Semester: 23-24 (Odd Semester)

Year: I year (2K23)

Maximum marks: 30

Time : 90 min.

First MID SEMSTER EXAMINATION

SECTION- A

Question 1.   Attempt all question

a.   If $u = \frac{x^2+y^2}{x^2-y^2} + 4$, then find $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = ?$ 1*9

b.   Two functions u and v are functionally dependent. Find their Jacobian with respect to x and y.

c.   Fill in the blank: $f(x,y) = f(2,3) + \cdots$

d.   If u is the composite number of t, defined by the relation $u = f(x,y)$, $x = \phi(t)$, $y = \psi(t)$, then total derivative $\frac{du}{dt} \cdots$.

e.   Find the minimum value of $\sqrt{x^2 + y^2}$.

f.   For maximum value of the function $f(x,y) = x^3 + y^3 - 3axy$ write the sign of $\frac{d^2f}{dx^2}$.

g.   Show that the $\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$

h.   Write the definition of the continuity of function of two variables.

i.   Find the degree of the following homogenous function $\log y - \log x$.

SECTION- B   3*3

Question 2. Find the maximum and minimum value of the

function $f(x,y) = x^4 + y^4 - x^2 - y^2 + 1$.

Question 3. Find the Taylor series expansion of the function

$f(x,y) = \cos x \cos y$ at $(0,\pi)$ up to six terms.

Question 4. Calculate $\frac{\partial(u,v)}{\partial(x,y)}$ for $x = e^u \cos v$ and

$y = e^u \sin v$.

SECTION C   4*3=12.

Question 5.

(a) State and Prove Euler Homogenous Theorem.

(b) Show that the following function is discontinuous at the given point

$$f(x,y) = \begin{cases} \frac{x-y}{x+y}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$$

At the point (0, 0).

Question 6.

(a). Find the maximum value of the function $x^m y^n z^p$, subject to the condition $x + y + z = a$.

(b). Find $\frac{du}{dt}$ as a total derivative and verify the result by direct substitution if $u = x^2 + y^2 + z^2$ and $x = e^{2t}, y = e^{2t}\cos 3t, z = e^{2t}\sin 3t$.

DEPARTMENT OF CHE
RSITY INSTITUTE OF ENGINEERING AND TECHNOLOGY, CSJM UNIVERSITY, KANPUR

Subject Name: Basic Electrical & Electronics Engg. (Subject code: ESC S-101)

lester: I Sem   Year: Ist Year (2K23)

First Mid Semester Examination

Total Marks: 30

lestions are compulsory.

Section (A)

carries 1 mark: [9X1=9]

Define active and passive components.
In ohm's law when the resistance is increased current voltage will ...
In which circuits, voltage divider is applied.
What do you understand by linear and non-linear components?
What is relation among node, branch and loop?
What happens to voltage when current is zero?
Write the statement of Thevenin's theorem.
Ohm's law is not applicable to _____
    rcuits   b) high currents   c) small resistors   d) semi-conductors
What happens to voltage when current is zero?

Section (B)
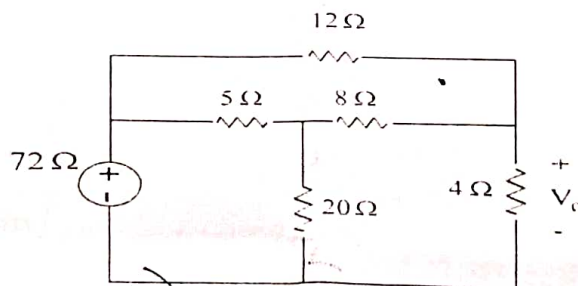
Each question carries 3 marks: [3X3=9]

Write down the statement of maximum power transfer theorem and prove that $R_{th}=R_1$
What do you understand by unilateral and bilateral components.
Write down the statement of Superposition and norton theorem.

Section (C)

Each carries 6 marks: [2X6=12]

Using Thevenin's theorem find V_o for the given Circuit :

nesh analysis find the current I_1, I_2, I_3, I_4 for the given network:

Section A [Total: 8 marks (1 mark each)]

1. Find the divergence of a vector field in three dimensions: $\vec{F}(x, y, z) = x^2\hat{i} + 2z\hat{j} - y\hat{k}.$
2. Find the curl of the vector field $\vec{F}(x, y, z) = y^3\hat{i} + xy\hat{j} - z\hat{k}.$
3. A person walked 65 m, 25 degrees East of North. What were his horizontal and vertical components?
4. Differentiate between centripetal and centrifugal force (two differences).
5. Define Coriolis force.
6. What is the difference between inertial and non-inertial frames .Is Earth an inertial frame?
7. Explain fictious force with an example.
8. If the centripetal force is removed, what will happen to an object moving in a circular motion?

Section B [Total: 6 marks (2 mark each)]

1. If $\emptyset = 6x^3 y^2 z, find\ div\ grad\ \emptyset$
2. Find constant a, b and c so that vector
   $$\vec{A} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k} \text{ is irrotational.}$$
3. For a position vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, find the values of:
   (a) $div\ (r^n\ \vec{r})$ (b) $curl\left[\frac{\vec{r}}{r^3}\right]$

Section C [Total: 6 marks (3 mark each)]

1. Proove that the centripetal force for a body undergoing circular motion is given by:

   $F = mv^2/r$

2. The polar coordinates of a point are $r, \theta, \phi = 8, 30^0, 45^0$. Find the Cartesian coordinates of the same point.

Time 1:30 hrs   Max marks 30

Note: All the questions are compulsory

Section A (9 marks)

Q1. Fill in the blanks: (5)

a) _____ channel of communication is used in emergency situations.
b) Paragraph dealing with the space and area is called a _____ order of writing.
c) Receiver _____ the message to understand its meaning in the process of communication.
d) Hierarchical barriers can be eliminated through _____.
e) He had _____ at breakfast and ran to school. (Serial, Cereal) Fill in correct Homophones

Q2.   Do as directed.   (4)

a.   The **antonym** of   (i)   wise   (ii)   shallow

b.   The **synonym** of   (i)   peril   (ii)   savoury

c.   Make **adjective** of nouns (i) glamour   (ii)   outrage

d.   Write both the meanings of the given **homonym**   (i) Rose

Section B (9 marks)

Q3. What do you understand by technical communication and how is it different from General communication?

Q4. What is Mass communication? State its features.

Q5. What are departmental barriers? Also explain how to remove these barriers.

Section C (12 marks)

Q6. How does downward channel help in keeping a check and access on the employees? Elaborate.

Q7. Explain the process of communication with the help of a diagram.

Q.1 FV of line AB is 50^0 inclined to XY and measures 55 mm long while it's SV is 60^0 inclined to XY line. If end A is 10 mm above HP and 15 mm in front of VP, draw its projections, find TL, inclinations of line with HP & VP. (7.5)

Q.2 TV of a 75 mm long line CD, measures 50 mm. End C is in HP and 50 mm in front of VP. End D is 15 mm in front of VP and it is above HP. Draw projections. (7.5)

Q.3 Line AB, It's Fv and Tv measure 50 mm & 60 mm long respectively. End A is 10 mm above Hp and 15 mm in front of Vp and distance between end projectors 35 mm .Draw projections of line AB if end B is in first quadrant. Find angle with Hp and Vp. (7.5)

Q.4 A line AB 85 mm long has its end A 25 mm away from both the reference planes and is in the first quadrant. Side view of line inclined at 45^0 to HP and 45^0 to VP. Draw profile plane projections. (7.5)