HONORCODE ELT23-4-4774

Siddhika Shukla

has successfully completed the course spanning over 12 modules. The training helps people in understanding energy, its generation, consumption, wastage, carbon footprint, impact on the environment, means to avoid and minimize energy usage, alternative energy solutions, ways to become carbon neutral, misconceptions on solar energy, and approach to adopt solar energy solutions. This training is a part of the "ENERGY LITERACY TRAINING" of the Energy Swaraj Foundation.

19-04-2023

Organization

Funding Partners

CERTIFICATE

OF PARTICIPATION

This certificate is awarded to

Siddhika shukla

For participating in the event "ROADMAP TO WEB DEVELOPMENT" by **IEEE GTBIT SB CS Chapter** held on **10TH January 2022.**

MR. MUKESH SAHU

BRANCH COUNSELLOR, IEEE GTBIT

APPLIED MATHEMATICS – I

Mid-Term Examination

First Semester (B. Tech.)

Maximum Marks: 30

Paper code: ETMA-101 Time: 1Hr

Note: Question no. 1 to 20 carry 1 mark each.

Q1: If V= $(x^2+y^2)^{m/2}$. Find the value of m which will make $\frac{\partial^2 V}{\partial x^2}+\frac{\partial^2 V}{\partial y^2}=0$.

I. m= -1
II. m= 0
III. m= 1
IV. m= 2

Q2: If u=$\tan^{-1}(\frac{x^3+y^3+z^3}{ax+by+cz})$ Find the value of $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}$.

I. -sin2u
II. cos2u
III. sin2u
IV. sin u

Q3: If $(cosy)^x-(sinx)^y$ = 0. Then value of $\frac{dy}{dx}$.

I. $\frac{\log cosy - ycotx}{xtany + logsinx}$
II. $\frac{\log cosy + ycotx}{xtany + logsinx}$
III. $\frac{\log cosy - ycotx}{xtany - logsinx}$
IV. $\frac{\log cosy + ycotx}{xtany - logsinx}$

Q4: For the transformation $\mathrm{u}=\mathrm{a}(\mathrm{x}+\mathrm{y}), \mathrm{v}=\mathrm{b}(\mathrm{x}-\mathrm{y})$ and

$\mathrm{x}=r^2\sin 2\theta$, $y=r^2\cos 2\theta$. Find the Value of $\frac{\partial(u,v)}{\partial(r,\theta)}$.

I. -8abr^3
II. 8abr^3
III. -8abr^2
IV. 8abr^2

Q5: Solve -y dx+ x dy=0

I. $\frac{y}{x}=c$
II. $\frac{x}{y}=c$
III. $\frac{y^2}{x}=c$
IV. $-\frac{x^2}{y}=c$

Q6: Examine the function f (x, y) = $x^3e^{-x^2-y^2}$ for maximum and minimum.

a) f (x, y) is maximum at point $(\frac{\sqrt{3}}{2},0)$

b) $\mathrm{f(x,y)}$ is minimum at point $(\frac{-\sqrt{3}}{2},0)$

Which of the following statement is true?

I. Option a) is true and Option b) is false.
II. Option a) is and Option b) both are true.
III. Option a) is and Option b) both are false.
IV. Option a) is false and Option b) is true.

Q7: Find the stationary value of $a^3x^2 + b^3y^2 + c^3y^2$ subject to the fulfilment of the condition $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$.

I. $(-a - b - c)^3$
II. $(a - b - c)^3$
III. $(a - b + c)^3$
IV. $(a + b + c)^3$

Q8: Solve $y' - 1 = y^2$

I. y= tan(x+2)
II. y=tan(x+1)
III. y=tan x
IV. y= -tan(x+1)

Q9: Using Jacobian, Find $\frac{\partial u}{\partial x}$ If $u^2 - xy^2 + xy = 0$ and $u^2 - uvx - v^2 = 0$

I. $\frac{v}{2y}$
II. $\frac{u}{2y}$
III. $-\frac{u}{2x}$
IV. $-\frac{v}{2x}$

Q 10: Given the family S of the curves given by

F (x, y, c) = $\frac{1}{2}x^2 + y^2 = c$ which is a family of ellipses, determine the family T of orthogonal trajectories.

I. $y = c^*x^2$
II. y = cx
III. y = c (x +a)
IV. y = ax +by

Q11: Solve $y' + y\ tanx = sin\ 2x$

I. y = $c\ cosx - 2cos^2x$
II. y = $c\ sinx - 2cos^2x$
III. y = $c\ cosx - 2sin^2x$
IV. y = $c\ sinx - 2sin^2x$

Q12: Solve the following Differential Equation

$$y'' + 0.4y' + 9.04y = 0$$

I. y = $e^{-0.2x}(Acos3x + Bsin2x)$
II. y = $e^{-0.2x}(Acos3x + Bsin3x)$
III. y = $e^{-0.2x}(Acos3x - Bsin3x)$
IV. y = $e^{-0.2x}(Acos2x + Bsin3x)$

Q13: Find an Integrating Factor of the following Initial Value problem

$(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0$, y (0) = -1

I. e^y
II. $-e^{-y}$
III. e^{-y}
IV. $-e^y$

Q14: Solve cos(x + y)dx + $(3y^2 + 2y + cos(x + y))dy = 0$ and find the solution u (x, y)

I. u (x, y) = sin (x +y) $+y^3 + y^2$
II. u (x, y) = sin (x +y)$-y^3 + y^2$
III. u (x, y) = sin (x +y) $+y^3 - y^2$
IV. u (x, y) = sin (x +y)$-y^3 - y^2$

Q15: Evaluate $\int_0^1 \frac{x^a-1}{logx} dx\ ,\ a \geq 0$

I. F(a)= log(1−a)
II. F(a)= log(1+ka)
III. F(a)= log(1−ka)
IV. F(a)= log(1+a)

Q16: What is the characteristic shape of a curve illustrating logistic growth?

I. $J - Shaped$
II. $U - Shaped$
III. $S - Shape$
IV. $L - Shaped$

Q17: Solve the differential equation $x^2y'' - 5xy' + 9y = 0$.

I. $(c_1 + c_2 \ln x)x^3$
II. $(c_1 - c_2 \ln x)x^3$
III. $(c_1 - c_2 \ln x)x^{-3}$
IV. $(c_1 + c_2 \ln x)x^{-3}$

Q18: Find the Wronskian. If the functions $y_1 = \cos \omega x$ and $y_2 = \sin \omega x$ are solutions of $y'' + \omega^2 y = 0$

I. ω^2
II. ω
III. ω^3
IV. ω^4

Q19: Solve $(x^2y^3 + 2y)dx + (2x - 2x^3y^2)dy = 0$

I. $x = cy^2e^{\frac{1}{x^2y^2}}$
II. $x = ce^{\frac{1}{x^2y^2}}$
III. $x = cy^2e^{-(\frac{1}{x^2y^2})}$
IV. $x = ce^{-(\frac{1}{x^2y^2})}$

Q20: Solve $\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x \sec y$

I. $\sin y = (1+x)(\ e^x + c)$
II. $\sin y = (1-x)(\ e^x + c)$
III. $\sin y = (1+x)(- e^x + c)$
IV. $\sin y = (1-x)(\ e^x - c)$

Attempt any two Questions. Question 21, 22 and 23 carry 5 marks each.

Q21: Sketch the direction field for the following differential equation $y' = y - x$

What are direction fields used for?

Q22: By the method of Variation of parameter. Solve $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$

Q23: Find the maximum and minimum values of

f (x, y) = $(x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$

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