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Reg.No.: | | | | | | | | |

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 2012

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – AUG. / SEP. 2023
First Semester
U19MA101 - CALCULUS
(Regulation 2019)
(Common to all Branches)

Time : Three Hours   Maximum : 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Find $\lim\limits_{x \to a} \dfrac{x^{5/8} - a^{5/8}}{x^{1/3} - a^{1/3}}$.	2	K1	CO1
2.	Find the critical values of the function $f(x) = 2x^3 - 3x^2 - 36x$.	2	K1	CO1
3.	If $u = (x - y)(y - z)(z - x)$, then show that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$.	2	K2	CO2
4.	Define stationary value.	2	K2	CO2
5.	Evaluate $\int\limits_{0}^{\pi/2} \sin^7 y \, dy$.	2	K1	CO3
6.	Integrate $\int \dfrac{1}{(x+1)(x+2)} dx$.	2	K2	CO3
7.	Evaluate $\int\limits_{0}^{1}\int\limits_{0}^{2} xy^2 \, dy \, dx$.	2	K2	CO4
8.	Evaluate $\int\limits_{0}^{a}\int\limits_{0}^{b}\int\limits_{0}^{c} e^{x+y+z} \, dz \, dy \, dx$.	2	K2	CO4
9.	Solve $(D^2 - 9)y = 0$.	2	K1	CO5
10.	Reduce the equation $(x^2 D^2 + xD + 1)y = \log x$ into an ordinary differential equation with constant coefficients.	2	K2	CO5

PART – B

Q.No.	Questions	Marks	KL	CO

11. a) Find the absolute and local maximum & minimum values of $f(x) = 3x^4 - 16x^3 + 18x^2, -1 \le x \le 4.$ **16   K3   CO1**

(OR)

b) The equation of motion of a particle is $S = t^3 - 3t$ where S is in meters and t is in seconds. Find   **16   K3   CO1**
   i. the velocity and acceleration as functions of t,
   ii. the acceleration after 2S, and
   iii. the acceleration when the velocity is 0.

12. a)
   i. If $u = \cos^{-1}\left(\dfrac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = -\dfrac{1}{2}\cot u$ **8   K3   CO2**

   ii. Expand $e^x \cos y$ about $\left(0, \dfrac{\pi}{2}\right)$ up to the third term using Taylor's series.   **8   K3**

(OR)

b)
   i. Examine $f(x,y) = x^3 + y^3 - 12x - 3y + 20$ for its extreme values.   **10   K3   CO2**

   ii. If $u = \dfrac{yz}{x}, v = \dfrac{zx}{y}, w = \dfrac{xy}{z}$, show that $\dfrac{\partial(u,v,w)}{\partial(x,y,z)} = 4$.   **6   K3**

13. a)
   i. Evaluate $\displaystyle\int \dfrac{2x+3}{(2x+1)(1-3x)}dx$ **8   K3   CO3**

   ii. Evaluate $\displaystyle\int e^x \cos x\, dx$.   **8   K3**

(OR)

b) Evaluate $\displaystyle\int_0^{\pi/2} \cos^n x\, dx$. Also find $\displaystyle\int_0^{\pi/2} \cos^7 x\, dx$.   **16   K5   CO3**

14. a)
   i. Evaluate $\displaystyle\int_0^1 \int_0^{\sqrt{1+x^2}} \dfrac{dx\,dy}{1+x^2+y^2}$.   **6   K3   CO4**

   ii. Change the order of integration and hence evaluate $\displaystyle\int_0^a \int_y^a \dfrac{x}{x^2+y^2}dx\,dy$.   **10   K3**

(OR)

b)
   i. Find the area of the circle $x^2 + y^2 = a^2$.   **8   K3   CO4**

   ii. Find the volume of the sphere $x^2 + y^2 + z^2 = a^2$.   **8   K3**

15. a) Solve $(D^2 + 1)y = \tan x$ by method of variation of parameters.   **16   K5   CO5**

(OR)

b)
   i. Solve : $(x^2 D^2 - xD + 1)y = \log x$ **8   K3   CO5**

   ii. Solve $\left[(2x+3)^2 D^2 - 2(2x+3)D - 12\right]y = 6x$.   **8**