



VIT

Vellore Institute of Technology

SLOT: B1+TB1

SCHOOL OF ADVANCED SCIENCES
DEPARTMENT OF MATHEMATICS
CONTINUOUS ASSESMENT TEST-II
FALL SEMESTER 2022-2023

Programme Name & Branch : B. Tech.
Course Code & Course Name : BMAT101L- CALCULUS
Date of Examination : 12-12-2022
Faculty Name(s) : Common Question paper
Duration : 90 min.
Max. Marks : 50 Marks

General instruction(s): Answer all the Questions

Q. No.	Question	Marks
1.	(a) Determine the Linear $L(x,y)$ and Quadratic $Q(x,y)$, Taylor polynomial approximations for the function $f(x,y) = \sqrt{20-x^2-7y^2}$ at the point $P(2,1)$.	5M
	(b) Obtain the maximum and minimum values of the function $f(x,y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 2$.	5M
2.	Suppose you are running a factory, producing some sort of widget that requires steel as a raw material. Your costs are predominantly human labor, which is 20 dollar per hour for your workers, and the steel itself, which runs for 170 dollar per ton. Suppose your revenue R is loosely modeled by the equation $R(h,s) = 200h^{\frac{2}{3}}s^{\frac{1}{3}}$, where h represents hours of labour, s represents tons of steel. If your budget is 20,000 dollars, what is the maximum possible revenue.	10M
3.	Change the order of integration $\int_0^4 \int_{\sqrt{y}}^2 \sqrt{x^2+1} dx dy$ and Evaluate it.	10M
4.	Find the volume of the region bounded by the paraboloid $az = x^2 + y^2$ and the cylinder $x^2 + y^2 = b^2$. Also find the integral in cases when $a = 2$ and $b = 2$.	10M
5.	(a) Evaluate the integral $\int_0^{\frac{\pi}{2}} \sqrt{\tan \theta} d\theta$.	5M
	(b) Express the integral $\int_0^{\infty} \frac{x^a}{a^2} dx$ ($a > 0$) in terms of gamma function.	5M

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$$\frac{1}{2} \sqrt{\frac{3}{4}} \cdot \sqrt{\frac{1}{4}}$$