

G. S. Mandal's
 Maharashtra Institute of Technology, Aurangabad
 (An Autonomous Institute)
 MAKE-UP EXAMINATION
First Year B.Tech (All) -April/May 2022

Course Code : BSC101

Course Name : Calculus & Differential Equations

Duration: 2 Hrs

Max. Marks : 50

Date : 04/05/2022

Instructions :

- i) All questions are compulsory
 ii) Assume suitable data wherever necessary and clearly state it
 iii) Figures to the right indicate full marks

Q. 1	Solve/Answer Any Five (Marks: 10)			
	Questions	Marks	CO	BL
a)	State Maclaurin's Theorem or Series	2	1	1
b)	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n^2}{2^n}$	2	2	2
c)	Is $(y^2 - x^2)dx + 2xydy$ is Exact? Justify your answer.	2	3	3
d)	Write the differential equation of R-C Circuit	2	4	3
e)	If u is a function of x and y then by Euler's theorem $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \dots\dots$	2	5	3
f)	If $u = f_1(x, y, z)$ and $v = f_2(x, y, z)$ then determinant $w = f_3(x, y, z)$ $\frac{\partial(u, v, w)}{\partial(x, y, z)} = \dots\dots$	2	6	3
Q. 2	i) Find the n^{th} order derivative of $y = \cos^2 x$	4	1	1
	ii) Evaluate $\lim_{x \rightarrow 0} \frac{xe^x - \log(1+x)}{x^2}$	4	1	
Q. 3	State Cauchy's n^{th} root test and Examine the convergence of the series	2	2	2
	$\sum_{n=0}^{\infty} \frac{(n+1)^n}{n^{n+1}} x^n$	6		
Q. 4	i) Solve $x \frac{dy}{dx} + y \log y = xe^x y$	2 2	3	3
	ii) Solve $\frac{dy}{dx} + \frac{3y}{x} = \frac{\sin x}{x^3}$	6 6		
Q. 5	A particle of mass 'm' moves under gravity in a medium whose resistance is k times its velocity. If the particle is projected vertically upward direction with initial velocity			

	<p>'V', Show that the time to reach the maximum height is $\frac{m}{k} \log \left[1 + \frac{kv}{mg} \right]$</p> <p style="text-align: center;">OR</p> <p>A coil having resistance of 15 ohms and an inductance L of 10 henneries is connected to 90 volts power supply. Determine the value of the current after 2 seconds.</p>	8	4	3
Q. 6	<p>i) If $u = x^y$, Show that $\frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$</p> <p>ii) If $z = xy^2 + x^2y$ where $x = at^2$, $y = 2at$ find $\frac{dz}{dt}$</p> <p style="text-align: center;">OR</p> <p>i) Discuss the maxima and minima of $x^2 + y^2 + 6x + 12$</p> <p>ii) Find the Jacobin $\frac{\partial(u,v)}{\partial(x,y)}$ for $u = e^x \sin y$, $v = x + \log \sin y$</p>	8	5	3
		4	6	3
		4	6	