MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

SECOND SEM. B.Tech. DEGREE END SEMESTER MAKE UP EXAMINATION-JUNE 2016
SUB: ENGG. MATHEMATICS II (MAT 1201)
(REVISED CREDIT SYSTEM)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions. All full questions carry equal marks.

1A.	Expand $f(x, y) = e^x \sin y$ in powers of x and y up to third degree terms.	**3 Marks**
1B.	Find the nature of the series $$\frac{1}{1^2} + \frac{1+2}{1^2 + 2^2} + \frac{1+2+3}{1^2 + 2^2 + 3^2} + \ldots$$	**3 Marks**
1C.	Find the area common to the curves $r = a(1-\cos\theta)$ and $r = a\sin\theta$, using double integration.	**4 Marks**
2A.	Change the order of integration and evaluate $\int_0^1 \int_{\sqrt{y}}^{2-y} xy\,dxdy$	**3 Marks**
2B.	Using beta gamma functions, show that $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\,d\theta \cdot \int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}}\,d\theta = \pi$	**3 Marks**
2C.	Test the nature of series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \cdots$	**4 Marks**
3A.	Find the equation of a sphere whose great circle is $x^2 + y^2 + z^2 + 10y - 4z = 8$, $x + y + z = 3$.	**3 Marks**
3B.	Find the volume common to the cylinders $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$.	**3 Marks**
3C.	Find the Laplace transform $f(t) = \begin{cases} 1, & 0 \leq t < 2 \\ -1, & 2 \leq t < 4 \end{cases}$ where $f(t + 4) = f(t)$ for all t.	**4 Marks**

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4A.	Find the extreme values of $f(x, y) = xy\,(a - x - y)$	**3 Marks**
4B.	If u = $\tan^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$ then show that $xu_x + yu_y = \sin 2u$	**3 Marks**
4C.	Find the inverse Laplace transform of $\dfrac{s^2}{(s-2)^3}$.	**4 Marks**
5A.	Evaluate $\lim\limits_{x \to 0} \dfrac{xe^x - \log(1 + x)}{x^2}$	**3 Marks**
5B.	Solve using Laplace transform: $\dfrac{d^2x}{dt^2} + 2\,\dfrac{dx}{dt} + 5x = e^{-t}\sin t, \qquad x(0) = 0, x'(0) = 1.$	**3 Marks**
5C.	If u = $e^{ax + by}$ f (ax − by) then using the concept of composite functions show that b $\dfrac{\partial u}{\partial x}$ + a $\dfrac{\partial u}{\partial y}$ = 2 abu	**4 Marks**