

**II Semester BTech Examination August 2022  
(Common to ALL Branches)**

Set No.: 1

Course name: ENGINEERING MATHEMATICS II

Course code: MAT 1251

Q. No.	Description	Marks	Course Outcome (1-5)	Competency Levels (1-6)
1(A)	(i) Using Euler's theorem, if $u = \sin^{-1} \left( \frac{x+y}{\sqrt{x}+\sqrt{y}} \right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{\tan u}{2}$ .  (ii) Evaluate $\lim_{x \rightarrow \pi/2} \frac{\log \cos x}{\tan x}$ .	6	1	3
1(B)	Find the extreme values of the function $f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$ .	4	2	3
2(A)	Expand $f(x, y) = e^x \cos y$ in powers of $x$ and $y$ up to third degree terms.	5	2	3
2(B)	Find the equation of the sphere having the circle $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0$ ; $x + y + z = 3$ as a great circle.	5	2	3
3(A)	Test the convergence of the series $\sum_{n=1}^{\infty} \frac{2n+3}{n(2n+1)(2n+2)}$ .	5	5	3
3(B)	(i) Find $L\{e^{-2t} \cos 2t\}$  (ii) Find $L^{-1}\left\{\frac{s}{s^2+10s+26}\right\}$	5	4	3
4(A)	Solve the differential equation using Laplace transform $y''(t) - 7y'(t) + 12y(t) = 0$ , $y(0) = 1$ , $y'(0) = 0$ .	5	4	3
4(B)	Using beta and gamma functions, evaluate (i) $\int_0^{\frac{\pi}{2}} \sin^5 \theta \cos^7 \theta d\theta$  (ii) $\int_0^1 x^3(1-\sqrt{x})^5 dx$	5	3	3
5(A)	Change the order of integration and evaluate $\int_0^4 \int_{\frac{x^2}{4}}^{2\sqrt{x}} xy dy dx$ .	5	3	3
5(B)	Using double integration, find the area of the region bounded by $r = a(1 + \cos \theta)$ .	5	3	3