MAY 2022: END SEMESTER ASSESSMENT (ESA) B TECH I SEMESTER **UE20MA101 – ENGINEERING MATHEMATICS - I**

1 a) Test the convergence of the series $\sum_{n=1}^{\infty} \sqrt{n^4+1} - \sqrt{n^4-1}$ b) Discuss the convergence of the series $\frac{1}{1.2.3} + \frac{3}{2.3.4} + \frac{5}{3.4.5} + \cdots$	Γ	Time: 3 Hrs Answer All Questions Max Marks:							
b) Discuss the convergence of the series $\frac{1}{1.2.3} + \frac{3}{3.4.5} + \frac{5}{3.4.5} + \cdots \dots \dots$ C) Obtain the nature of the series $\frac{2^2}{3.4}x^2 + \frac{2^2 4^2}{3.4.5.6}x^4 + \frac{2^2 4^2 6^2}{3.4.5.6.7.8}x^6 + \cdots \dots \dots$ 2 a) If $u = \sqrt{x^4 + y^4} \tan^{-1}(y/x)$ prove the following: i. $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ ii. $x^2 \frac{\partial^2 u}{\partial^2 x} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial^2 y} = 2u$ b) Expand $e^{ax} \sin by$ about the origin upto third degree terms c) Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube. 3 a) Solve: $\frac{dy}{dx} - \frac{\tan y}{1+x} = (1+x)e^x secy$ b) Show that the family of curves $\frac{x^2}{a^2+\lambda} + \frac{y^2}{b^2+\lambda} = 1$, where ' λ ' is a parameter is self orthogonal. c) Solve: $y^3 - 4xyp + 8y^2 = 0$ 4 a) Solve: $y^3 - 3y' + 2y = \frac{1}{1+e^{-x}}$ by the method of variation of parameters. b) Solve: $(5+2x)^2y'' - 6(5+2x)y' + 8y = log(5+2x)$ c) At $t = 0$, a current flows in an LCR circuit with resistance $R = 40$ ohms, inductance $L = 0.2$ henrys and capacitance $C = 10^{-5}$ farads. Find the current flowing in the circuit at $t > 0$ if the initial change on the capacitor is 1 coulomb. Assume that $E(t) = 0$ for $t > 0$.	1 a)		Test the convergence of the series $\sum_{n=1}^{\infty} \sqrt{n^4 + 1} - \sqrt{n^4 - 1}$						
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