6. a) Solve $\frac{\partial^3 z}{\partial x^2 \partial y} + 18xy^2 + \sin(2x - y) = 0$ by direct integration. 6 L2

b) Solve the following non-linear partial differential equations
i) $zpq = p + q$ ii) $p^2 + q^2 = x + y$ 7 L2

c) Derive one dimensional heat flow equation of the form
$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$. 7 L3

7. a) Evaluate $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a} (x^2+y^2+z^2)\, dxdydz$. 6 L2

b) Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. 7 L3

c) Using double integrals find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 7 L3

8. a) Prove that $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta \cdot \int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$. 6 L2

b) Evaluate $\iint_D (x^2+y^2)\, dxdy$ where D is the region bounded by $y = x$ and $y^2 = 4x$. 7 L2

c) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\, dydx$ by changing the order of integration. 7 L3

9. a) Find $L\{\frac{\sin^2 t}{t}\}$. 6 L1

b) Find L $\{f(t)\}$ if $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$ and $f(t+2\pi) = f(t)$. 7 L2

c) Express $f(t) = \begin{cases} t^2, 0 < t \le 2 \\ 4, 2 < t \le 4 \\ 0, t > 4 \end{cases}$ in terms of unit step function and hence find its Laplace transform. 7 L2

10. a) Find the inverse Laplace transform of $\frac{1}{s^2(s+1)^2}$ by using the convolution theorem. 6 L1

b) Find the inverse Laplace transform of i) $\log\left[\frac{s^2+1}{s(s+1)}\right]$
ii) $\frac{3(s^2-2)^2}{2s^5}$. 7 L2

c) Solve $x''(t) + x(t) = 6\cos 2t,\ x(0) = 3,\ x'(0) = 1$ by the Laplace transform method. 7 L2

BT* Bloom's Taxonomy, L* Level; CO* Course Outcome; PO* Program Outcome

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NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester B.E. (Credit System) Degree Examinations

Make up/Supplementary Examinations – September 2021

20MA201 – ENGINEERING MATHEMATICS - II

tion: 3 Hours | Max. Marks: 100

*Note: Answer any **Five full** questions.*

	Question	Marks	BT*	CO*	PO*
a)	Solve $(x^3+\cos y+\frac{1}{x})dy=(\frac{y}{x^2}-3yx^2)dx$.	6	L*2	1	1
b)	Solve $\frac{dx}{dy}=\frac{(\tan^{-1}y)-x}{1+y^2}$.	7	L3	1	2
c)	The law for the decay of radio active materials states that disintegration at any instant is proportional to the amount of material present. If 30% of the radio active substance disappeared in 10 days, find how long will it take for 90% of it to disappear.	7	L2	1	1
a)	Find the general and singular solutions of the equation $y=xp+\frac{a}{p}$.	6	L2	1	1
b)	Obtain the orthogonal trajectories of the family of curves $r^n=a\sin n\theta$.	7	L2	1	1
c)	Solve $p^3+2xp^2-y^2p^2-2xy^2p=0$.	7	L3	1	2
a)	Solve $\frac{d^2y}{dx^2}+\frac{dy}{dx}+y=1-e^x+5x^2$.	6	L2	2	1
b)	Solve $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+y=\log x$.	7	L2	2	2
c)	Solve $(D^2+5D+6)y=2e^x+3c^{3x}+7$	7	L2	2	2
a)	Solve $(D^2-2D+4)y=e^x\cos x$.	6	L2	2	1
b)	Solve $\frac{d^2y}{dx^2}+4y=\tan 2x$ by using the method of Variation of parameters.	7	L2	2	2
c)	Solve $y''+4y'+4y=3\sin x$.	7	L2	2	2
a)	Form the partial differential equation by eliminating the arbitrary functions and arbitrary constants from the equations i) $2z=\frac{x^2}{a^2}+\frac{y^2}{b^2}$ ii) $z=f(x^2+y^2)$	6	L2	3	2
b)	Solve $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}=0$ by the method of separation of variables.	7	L2	3	2
c)	Derive one dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$.	7	L2	3	2

P.T.O.