b) Evaluate $\int_0^1\int_0^2\int_1^2 x^2yz\,dxdydz$.

c) Find the volume common to the cylinders $x^2+y^2=a^2$ and $x^2+z^2=a^2$ using double integrals.

Unit – IV

7. a) If f(t) is a periodic function with period T so that f(t+ T)= f(t) for all values of t prove that $L(f(t)) = \dfrac{1}{1-e^{-sT}}\int_0^T e^{-st}f(t)dt$.

b) Solve $x''(t)+4x'(t)+4x(t)=4e^{-2t}$;$x(0)=-1$ $x'(0)=4$ by the Laplace transform method.

c) Find Laplace transform of (i) $e^{-3t}(2\cos 5t-3\sin 5t)$ (ii) $\dfrac{\cos at-\cos bt}{t}$

8. a) Using partial fractions obtain inverse Laplace transform of (i) $\dfrac{s^2+s-2}{s(s+3)(s-2)}$

(ii) Find $L^{-1}\{\dfrac{15}{s^2+4s+13}\}$.

b) Rewrite the following functionusing unit step function and find its Laplace transform, f(t)= $\begin{cases} t^2 & 0<t\le 3 \\ 4t & t>3 \end{cases}$.

c) Find the inverse Laplace transform of $\dfrac{1}{(s^2+1)(s+1)}$ using convolution theorem.

Unit – V

9. a) Formulate a partial differential equation of $Z=yf(x)+xg(y)$

b) Determine the solution of $\left(x^2-y^2-z^2\right)p+2xyq=2xz$ by Lagrange's method.

c) Using the method of separation of variables solve $\dfrac{\partial u}{\partial x}=4\dfrac{\partial u}{\partial y}$ given $u(0,y)=8e^{-3y}+4e^{-5y}$

10. a) Solve $\dfrac{\partial^2 z}{\partial x^2}+z=0$ given that when x=0, z = e^y and $\dfrac{\partial z}{\partial x}=1$.

b) Apply the method of separation of variables to determine the solution of $x^2\dfrac{\partial u}{\partial x}+y^2\dfrac{\partial u}{\partial y}=0$

c) Derive one dimensional wave equation in the form $\dfrac{\partial^2 y}{\partial t^2}=c^2\dfrac{\partial^2 y}{\partial x^2}$

BT* Bloom's Taxonomy, L* Level

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USN

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

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

April - May 2016

15MA201 – ENGINEERING MATHEMATICS - II

Duration: 3 Hours | Max. Marks: 100

Note: Answer Five full questions choosing **One full** *question from* **each** *Unit.*

Unit – I

		Marks	BT*
1. a)	Show that the differential equation $(y\cos x + \sin y + y)dx + (\sin x + x\cos y + x)dy = 0$ is exact. Hence find its solution.	6	L3
b)	Obtain the orthogonal trajectories of the family of curves $r^n = a\sin n\theta$.	7	L5
c)	Find the general and singular solutions of $p = \log(px - y)$	7	L2
2. a)	Solve $xp^2 + x = 2yp$.	6	L3
b)	When a resistance R ohms is connected in series with an inductance L henries with an e.m.f E volts, the current i amperes at time t is given by $L\frac{di}{dt} + Ri = E$. If $E = 10\sin t$ volts and $i = 0$, when $t = 0$, find i as a function of t.	7	L2
c)	Solve $y(x + y + 1)dx + x(x + 3y + 2)dy = 0$.	7	L3

Unit – II

		Marks	BT*
3. a)	Solve $(D^2-4D+3)\, y = \sin 5x$	6	L3
b)	Solve $(D^2+5D+6)\, y = e^{-2x} \sin 2x$	7	L3
c)	Solve $(D^2+4)\, y = \tan 2x$ using the method of variation of parameters.	7	L4
4. a)	Solve $(D^2+2D+2)\, y = 1+3x+x^2$	6	L3
b)	Solve $(D^2-D-2)\, y = 36xe^{2x}$	7	L3
c)	Solve $(D^2+2D+4)\, y = 2x^2+3e^{-x}$ by the method of undetermined multipliers.	7	L4

Unit – III

		Marks	BT*
5. a)	Prove that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	7	L
b)	Prove that $\int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta \cdot \int_0^{\pi/2} \dfrac{d\theta}{\sqrt{\sin\theta}} = \pi$.	6	L
c)	Evaluate $\int_0^1 x^7 (1 - x^4)^3\, dx$ in terms of gamma function	7	L
6. a)	Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2\, dy dx$ by changing the order of integration.	7	

P.T.O.

b) Evaluate $\int_0^{\infty}\int_0^{x} xe^{-\left(\frac{x^2}{y}\right)} dydx$ by changing the order of integration.

c) Find the volume bounded by the xy plane, the cylinder $x^2+y^2=1$ and the plane $x+y+z=3$.

Unit – IV

7. a) Find Laplace transform of (i) $4\sin^2 2t+5\cos 4t$

(ii) $\int_0^t e^{-t}\cos t\,dt$

b) If f(t) is a periodic function with period T so that f(t+ T) = f(t) for all values of t, prove that $L(f(t)) = \frac{1}{1-e^{-sT}}\int_0^T e^{-st} f(t)dt$.

c) Find the inverse Laplace transform of $\frac{1}{(s^2+1)(s+1)}$ using convolution theorem.

8. a) Rewrite f(t)= $\begin{cases}\sin t & 0<t\le\frac{\pi}{2}\\ \cos t & t>\frac{\pi}{2}\end{cases}$ using unit step function and find its Laplace transform.

b) Using partial fractions obtain inverse Laplace transform of $\frac{2s+3}{(s-1)(s+2)^3}$.

c) A voltage $E=E_0e^{-at}$ where E_0 and a are constants, is applied at time t=0 to an LR circuit of inductance L and resistance R. Find the current at time t>0.

Unit – V

9. a) Formulate a partial differential equation by eliminating the function F from the equation

$$F\left(x^2+y^2, z-xy\right)=0$$

b) Determine the solution of $\left(x^2-yz\right)p+\left(y^2-zx\right)q=z^2-xy$ by Lagrange's method.

c) Solve $\frac{\partial^2 z}{\partial x^2}=a^2 z$ given that when $x=0$, $\frac{\partial z}{\partial x}=a\sin y$ and $\frac{\partial z}{\partial y}=0$

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

b) Apply the method of separation of variables and hence determine the solution of $2x\frac{\partial z}{\partial x}-3y\frac{\partial z}{\partial y}=0$

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

BT* Bloom's Taxonomy, L* Level

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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 – July 2016

15MA201 – ENGINEERING MATHEMATICS - II

...n: 3 Hours Max. Marks: 100

Note: Answer **Five full** questions choosing **One full** question from **each Unit.**

		Marks	BT*
	Unit – I		
a)	Show that the differential equation $(y^3 - 3x^2y)dx - (x^3 - 3xy^2)dy = 0$ is exact. Hence find its solution.	6	L*3
b)	Find the orthogonal trajectories of family $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$ where λ is a parameter.	7	L2
c)	Find the general and singular solutions of $y = xp + \frac{a}{p}$.	7	L2
a)	Solve $\left(x\frac{dy}{dx}\right)^2 + xy\frac{dy}{dx} - 6y^2 = 0$.	6	L3
b)	If a body originally is at 80^0C cools down to 60^0C in 20 minutes. The temperature of air being 40^0C. Find the temperature of the body after 40 minutes from the original.	7	L2
c)	Solve $[xy\sin(xy) + \cos(xy)]ydx + [xy\sin(xy) - \cos(xy)]xdy = 0$.	7	L3
	Unit – II		
a)	Solve $(D^3-6D^2+11D-6)\ y = e^{-2x} + e^{-3x}$	6	L3
b)	Solve $(D^3+D^2+D+1)\ y = \cos 2x$	7	L3
c)	Solve $(D^2-4D+4)\ y = (e^{2x}/x)$ using the method of variation of parameters.	7	L4
a)	Solve $(D^2-4D+3)\ y = \sin x$	6	L3
b)	Solve $x^2(d^2y/dx^2)-2x(dy/dx)-4y = x^2+2\log x$	7	L3
c)	A spring is such that 1.96 kg weight streches it 19.6 cms, an impressed force (1/2) cos 8t is acting on the spring. If the weight is started from equilibrium point with an imparted upward velocity of 14.7 cm/s then determine the position of the weight as a function of time.	7	L4
	Unit – III		
a)	Evaluate $\int_0^1 \frac{x^\alpha - 1}{\log x}dx$ $\alpha \geq 0$ using differentiation under the integral sign.	6	L3
b)	Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.	7	L4
c)	Evaluate i) $\int_0^\infty x^4 e^{-x^2}\,dx$ ii) $\int_0^\infty x^6 e^{-2x}\,dx$	7	L[illegible]
a)	Evaluate $\int_0^a\int_0^x\int_0^{x+y} e^{x+y+z}\,dz\,dy\,dx$.	6	L[illegible]

P.T.O.