Enrolment No. 1 8 9 9 6 8 1

S$_1$ (All branch): All

B.TECH 1st SEMESTER, MID TERM EXAMINATION-2018
SUBJECT NAME: Engineering Mathematics-I
SUBJECT CODE: UMA11B04/UMA21B04

Full Marks: 50 | Time: 2 Hours

Symbols used here have their usual meanings

Group A

Answer the following questions

Marks: 25

1. Solve: $(xy\,sinxy + cosxy)ydx + (xy\,sinxy - cosxy)xdy = 0$
2. Solve the following ordinary differential equation
$$(x+y+1)\frac{dy}{dx} = 1$$
$\frac{dy}{dx} = \frac{1}{x+y+1}$

$(x+y+1)\frac{dy}{dx} = 1$

3. (a) Define Bernoulli's equation.
(b) Solve: $\left(xy^2 - e^{\frac{1}{x^3}}\right)dx - x^2ydy = 0$

4. Solve: $(D^2 + 3D + 2)y = e^{e^x}$

$e^{2x}.e^{-x}$

5. Solve the following differential equation by finding Complementary Function and Particular Integral $(D^2+9)y = xe^{2x}cosx$.
6. Find the general solution of homogeneous linear differential equation:
$$2D^2y + Dy - 6y = 0$$
7. Find the general solution of non-homogeneous linear differential equation:
$$(D^3 - D^2 - 6D)y = 1 + x^2$$

$xy^2 - e^{1/x^3})dx - x^2ydx$

(14)

[4 + 3 + (1 + 3) + 4 + 5 + 2 + 3 = 25]

$\frac{dx}{dy} = x+y+1$

$\frac{dy}{dx} + Py = Qy^n$

$\frac{1}{y^n}\frac{dy}{dx} +$

Group B

Answer the following questions

Marks: 25

1. By using the definition of Laplace Transform, evaluate Laplace Transform of (i) $coshat$ (ii) t^n. [2.5+2.5]

$\frac{dx}{dy} + x = (y+1)$ Q

2. (a) State First Shifting theorem of Laplace Transform. Using it, evaluate $L\{e^t cos^2 t\}$.
(b) Find $L\{G(t)\}$, where, $G(t) = \begin{cases} sin\left(t-\frac{\pi}{3}\right), & t > \frac{\pi}{3} \\ 0, & t < \frac{\pi}{3} \end{cases}$

[1+2+2]

3. State **Change of Scale property** of Laplace Transform. Evaluate: $L\{(t^2 - 3t + 2)sin3t\}$. [1+4]

4. Prove that, $L\{\frac{sin^2 t}{t}\} = \frac{1}{4}\log(\frac{s^2+4}{s^2})$.

$\frac{1}{2}\left[y\tan xy + \frac{1}{x}\right]dx +$

OR

$$L\{\int_0^t \frac{1-e^{-2x}}{x}dx\} = \frac{1}{s}\log(1+\frac{2}{s})$$

$\frac{1}{2}\left[x\tan xy - \frac{1}{y}\right]dy$

[5]

5. Evaluate $\int_0^\infty t^3 e^{-t} sint\,dt$, by using Laplace Transform. [5]

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~~Sin xy~~

$\frac{1}{(D-a)}Q = e^{ax}\int e^{e^x} e^{-ax} dx$

$\frac{\partial M}{\partial y} = x2y\sin xy + xy^2\cos xy$

$2D^2 + D - 6 = 0$

$4\times2\times6$

$\frac{\partial N}{\partial x} = 2xy\sin xy - xy^2$

C.F.

$2m^2 + m - 6$

$-1 \pm \sqrt{1-24}$

4

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SUBJECT NAME: Engineering Mathematics-I

SUBJECT CODE: UCE/UCS/UEC/UPE/UEI/UCH/UBE-02C07, UME/UEE-02C06

Full Marks: 50

Time: 2 H

Symbols used here have their usual meanings

GROUP – A

Answer the following questions:

Marks

1. (a) Define Exact Differential Equation.
   (b) Solve: $(1 + xy)y\,dx + (1 - xy)x\,dy = 0$
2. (a) Write the general form of non-homogeneous ordinary differential equation of order n.
   (b) Solve: $x^2y - x^3\frac{dy}{dx} = y^4\cos x$
3. (a) Define Clairaut's Equation.
   (b) Solve: $y + px = x^4p^2$
4. (a) Define Particular Integral.
   (b) Solve: $(D^3 - 4D^2 + 9D - 10)y = 24e^x\sin 2x$
5. Solve: $(D^2 + 1)y = x - \cot x$

Group B

Answer the following questions:

Marks:25

1. State First Shifting theorem of Laplace Transform. Evaluate $e^{-3t}\cosh 5t\sin 4t$ by using the definition of Laplace Transform.
2. Evaluate: $\int_0^\infty e^{-t}\left(\frac{1}{t}\int_0^t e^{-u}\sin u\,du\right)dt$ by using Laplace Transform. [1+4]
3. Define Heaviside's unit step function and then use it to find the Laplace Transform of $f(t)$, where [5]

$$f(t) = \cos t, 0 < t < \pi$$
$$= \cos 2t, \pi < t < 2\pi$$
$$= \cos 3t, t > 2\pi$$

4. (a) Explain Periodic Function.
   (b) Find the Laplace Transform of the periodic function $f(t)$, where [1+4]

$$f(t) = t, 0 < t < a$$
$$= 2a - t, a < t < 2a, \quad \text{and also } f(t + 2a) = f(t).$$

5. (a) Find the Laplace Transform of $f'(t)$, where [1+4]

$$f(t) = t + 1, \quad 0 \le t \le 2$$
$$= 3, \quad t > 2$$

   (b) Deduce that $L\{t^2f(t)\} = (-1)^2\frac{d^2}{ds^2}F(s)$, where $F(s) = L\{f(t)\}$.

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[3+2]

S_1 (ALL BRANCH): ALL

B.TECH 1st SEMESTER, MID-TERM EXAMINATION-2016
NAME OF SUBJECT: Engineering Mathematics-I
CODE NO: UCE/UCS/UEC/UEI/UPE/UCH/UBE/UME/UEE01C04

Full Marks: 50 Time: 2 Hours

Symbols used here have their usual meanings

Group A

Answer any five from following questions:

1. Solve the differential equation $x\frac{dy}{dx} - 3y = x^4(e^x + \cos x) - 2x^2$ given that $y = \pi^3 e^\pi + 2\pi^2$ when $x = \pi$.

2. (i) Write down the general form of a Bernoulli's equation.
   (ii) Solve: $(x - y\ \cos x)\,dx - \sin x\, dy = 0$ [1+4]

3. (i) Write down the necessary condition for an equation to be an exact differential equation.
   (ii) Solve: $\frac{dy}{dx} = \frac{y^3}{e^{2x}+y^2}$ [1+4]

4. (i) Write down the general form of a linear non-homogeneous ordinary differential equation with constant coefficients.
   (ii) Find the general solution of Ordinary Differential Equation $(D^2 + 4)y = \tan 2x$ [1+4]

5. Solve: $(D^2 - 4D + 4)\, y = 8\, x^2 e^{2x} \sin 2x$ [5]

6. (i) Solve: $(x^2 + y^2 + 1)dx - 2xy\, dy = 0$
   (ii) Solve: $x\frac{dy}{dx} + \frac{y^2}{x} = y.$ [2.5+2.5]

Group B

Answer any five from following questions:

7. (i) State the first shifting theorem of Laplace Transformation.
   (ii) Find the Laplace Transformation of $\frac{\cos 2t\ \sin t}{e^t}$. [2+3]

8. (i) Find $L\left\{\frac{e^{-t}\sin t}{t}\right\}$.
   (ii) Find $L\{g(t)\}$ where $g(t) = (t-1)^3$, when $t > 1$
   $= 0,$ when $t < 1$ [3+2]

9. Solve by using Laplace Transform:
   $(D^2 + 2D + 5)y = e^{-t}\sin t,\ y(0) = 0,\ y'(0) = 1.$ [5]

10. (i) Find the Laplace Transform of $\int_0^t te^{\ 3t} \sin^2 t\ dt$
    (ii) Find the inverse Laplace Transform of $\frac{(s+2)}{(s^2+4s+8)(s^2+4s+13)}$ [2.5+2.5]

11. (i) Find the inverse Laplace Transform of $\frac{2s+2}{(s^2+2s+10)}$
    (ii) Find the Laplace Transform of $t(\frac{\sin t}{e^t})^2$ [2.5+2.5]

B. TECH 1st SEMESTER MID TERM EXAMINATION 2014

1st

NAME OF SUBJECT: Engineering Mathematics - I

CODE NO: - HCL-MH-IT/CSE/CE/PE/ETCH/BE01C04

Time: 2 Hour

Full Marks: 30

Symbols used here have their usual meanings

Answer any three from the following questions:

1. a) Solve $\left(x\sqrt{1-x^2y^2}-y\right)dy+\left(x+y\sqrt{1-x^2y^2}\right)dx=0$
   b) Solve $\left(D^3-2D^2-5D+6\right)y=0,\ y(0)=0, y'(0)=0, y''(0)=1$
   c) If $L[f(t)]=\log\left(\frac{s+3}{s+1}\right)$ then find $L[f(2t)]$
   d) Evaluate $L\left[\frac{\cos 2t \sin t}{e^t}\right]$

(2.5+2.5+2+3)

2. a) Solve $\left(1+x+xy^2\right)dy+\left(y+y^3\right)dx=0$
   b) Solve $\left(D^2-2D-1\right)y=e^x\cos x$
   c) Find the Laplace transform of $f(t)=\begin{cases}\cos t & 0<t<\pi\\ \sin t & t>\pi\end{cases}$
   d) Find the inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ using convolution theorem.

(2+3+2+3)

3. a) Solve $x\sin x\frac{dy}{dx}+y(x\cos x-\sin x)=2$
   b) Solve $\left(D^2+3D+2\right)y=2x^2-3x+1$
   c) Evaluate $\int_0^\infty e^{-t}\int_0^t\frac{\sin u}{u}\,du\,dt$
   d) Evaluate $L^{-1}\left(\frac{3s+7}{s^2-2s-3}\right)$

(2.5+2.5+3+2)

4. a) Solve $\left(D^2-3D+2\right)y=0$
   b) Solve $\left(D^2-1\right)y=x\sin x+x^2e^x$
   c) Solve the ODE by using Laplace transform
      $(D-2)x+3y=0$
      $2x+(D-1)y=0;\ t>0$ and $D\equiv\frac{d}{dt}$ given that $x(0)=8$ and $y(0)=3$.
   d) Evaluate $L[t^2u(t-2)]$

(1.5+3.5+3+2)

5. a) Find the particular integral of $\left(D^2+a^2\right)y=\tan ax$
   b) Solve $x\frac{dy}{dx}+y\log y=xye^x$
   c) Solve the ODE by using Laplace transform
      $\frac{d^2x}{dt^2}+9x=\cos 2t$ if $x(0)=1$ and $x\left(\frac{\pi}{2}\right)=-1$
   d) Show that $L[t^n e^{at}]=\frac{n!}{(s-a)^{n+1}}$

(3+2+3+2)

S_1 (ALL BRANCH): ALL

B.TECH 1st SEMESTER, MID-TERM EXAMINATION-2016
NAME OF SUBJECT: Engineering Mathematics-I
CODE NO: UCE/UCS/UEC/UEI/UPE/UCH/UBE/UME/UEE01C04

Full Marks: 50 Time: 2 Hours

Symbols used here have their usual meanings

Group A

Answer any five from following questions: [25]

1. Solve the differential equation $x\frac{dy}{dx} - 3y = x^4(e^x + \cos x) - 2x^2$ given that $y = \pi^3 e^\pi + 2\pi^2$ when $x = \pi$. [5]

2. (i) Write down the general form of a Bernoulli's equation.
   (ii) Solve: $(x - y\ \cos x)\, dx - \sin x\, dy = 0$ [1+4]

3. (i) Write down the necessary condition for an equation to be an exact differential equation.
   (ii) Solve: $\frac{dy}{dx} = \frac{y^3}{e^{2x}+y^2}$. [1+4]

4. (i) Write down the general form of a linear non-homogeneous ordinary differential equation with constant coefficients.
   (ii) Find the general solution of Ordinary Differential Equation $(D^2 + 4)y = \tan 2x$ [1+4]

5. Solve: $(D^2 - 4D + 4)\, y = 8\, x^2 e^{2x} \sin 2x$ [5]

6. (i) Solve: $(x^2 + y^2 + 1)dx - 2xy\, dy = 0$
   (ii) Solve: $x\frac{dy}{dx} + \frac{y^2}{x} = y$. [2.5+2.5]

Group B

Answer any five from following questions: [25]

7. (i) State the first shifting theorem of Laplace Transformation.
   (ii) Find the Laplace Transformation of $\frac{\cos 2t\, \sin t}{e^t}$. [2+3

8. (i) Find $L\left\{\frac{e^{-t}\sin t}{t}\right\}$.
   (ii) Find $L\{g(t)\}$ where $g(t) = (t-1)^3$, when $t > 1$
   $= 0$, when $t < 1$ [3+2

9. Solve by using Laplace Transform:
   $(D^2 + 2D + 5)y = e^{-t}\sin t, y(0) = 0, y'(0) = 1$. [5]

10. (i) Find the Laplace Transform of $\int_0^t te^{-3t} \sin^2 t\, dt$
    (ii) Find the inverse Laplace Transform of $\frac{(s+2)}{(s^2+4s+8)(s^2+4s+13)}$ [2.5+2.5

11. (i) Find the inverse Laplace Transform of $\frac{2s+2}{(s^2+2s+10)}$
    (ii) Find the Laplace Transform of $t(\frac{\sin t}{e^t})^2$ [2.5+2.5]

S_1 (ALL BRANCH): ALL

B.TECH 1st SEMESTER, MID-TERM EXAMINATION-2016

NAME OF SUBJECT: Engineering Mathematics-I

CODE NO: UCE/UCS/UEC/UEI/UPE/UCH/UBE/UME/UEE01C04

Full Marks: 50 Time: 2 Hours

Symbols used here have their usual meanings

Group A

Answer any five from following questions: [25]

1. Solve the differential equation $x\frac{dy}{dx} - 3y = x^4(e^x + \cos x) - 2x^2$ given that $y = \pi^3 e^\pi + 2\pi^2$ when $x = \pi$ [5]

2. (i) Write down the general form of a Bernoulli's equation.

   (ii) Solve: $(x - y\ \cos x)\,dx - \sin x\,dy = 0$ [1+4]

3. (i) Write down the necessary condition for an equation to be an exact differential equation.

   (ii) Solve: $\frac{dy}{dx} = \frac{y^3}{e^{2x}+y^2}$ [1+4]

4. (i) Write down the general form of a linear non-homogeneous ordinary differential equation with constant coefficients.

   (ii) Find the general solution of Ordinary Differential Equation $(D^2 + 4)y = \tan 2x$ [1+4]

5. Solve: $(D^2 - 4D + 4)\,y = 8\,x^2 e^{2x} \sin 2x$ [5]

6. (i) Solve: $(x^2 + y^2 + 1)dx - 2xy\,dy = 0$

   (ii) Solve: $x\frac{dy}{dx} + \frac{y^2}{x} = y.$ [2.5+2.5]

Group B

Answer any five from following questions: [25]

7. (i) State the first shifting theorem of Laplace Transformation.

   (ii) Find the Laplace Transformation of $\frac{\cos 2t\ \sin t}{e^t}$. [2+3]

8. (i) Find $L\left\{\frac{e^{-t}\sin t}{t}\right\}$.

   (ii) Find $L\{g(t)\}$ where $g(t) = (t-1)^3$, when $t > 1$

   $= 0,$ when $t < 1$ [3+2]

9. Solve by using Laplace Transform:

   $(D^2 + 2D + 5)y = e^{-t}\sin t,\ y(0) = 0,\ y'(0) = 1.$ [5]

10. (i) Find the Laplace Transform of $\int_0^t te^{\ 3t}\sin^2 t\,dt$

    (ii) Find the inverse Laplace Transform of $\frac{(s+2)}{(s^2+4s+8)(s^2+4s+13)}$ [2.5+2.5]

11. (i) Find the inverse Laplace Transform of $\frac{2s+2}{(s^2+2s+10)}$

    (ii) Find the Laplace Transform of $t(\frac{\sin t}{e^t})^2$ [2.5+2.5]

B.TECH 1st SEMESTER, MID-TERM EXAMINATION-2015 S_1(ALL BRANCH): ALL

NAME OF SUBJECT: Engineering Mathematics-I

CODE NO: UCE/UCS/UEC/UFT/UPE/UCH/UBE/UME/UEE01C04

Full Marks: 50 Time: 2 Hours

Symbols used here have their usual meanings

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1. Answer all the following questions:

(a) Solve: $(x + y + 1)\frac{dy}{dx} = 1$

(b) Solve: $3x^2y^4dx + 4x^3y^3dy = 0,\ y(1) = 1$

(c) Solve: $\left(x\sqrt{1 - x^2y^2} - y\right)dy + \left(x + y\sqrt{1 - x^2y^2}\right)dx = 0$

(d) Solve: $\left(xy^2 - e^{1/x^3}\right)dx - x^2ydy = 0$

(e) Solve: $(D^3 - 2D^2 - 5D + 6)y = 0,\ y(0) = 0, y'(0) = 0, y''(0) = 1$, without using Laplace Transform .

(f) Solve the Ordinary Differential Equation $(D^4 + 4)y = 0$

(g) Find the general solution of Ordinary Differential Equation $(D^2 - 2D - 1)y = e^x cosx + x^2e^{3x}$

Or

Solve: $(D^2 + 3D + 2)y = xe^x sinx + x^2$

[3+4+4+4+3+2+5]

2. Answer all the following questions:

(a) Evaluate the Laplace transform of $\int_0^t t\cosh t\,dt$

(b) Evaluate the following integral using Laplace transform

$$\int_0^\infty e^{-2t}\sin\left(t + \frac{\pi}{4}\right)\cos\left(t - \frac{\pi}{4}\right)dt$$

(c) Evaluate inverse Laplace transform using convolution theorem

$$\frac{1}{s(s^2+a^2)}$$

(d) Evaluate Laplace transform of the following periodic functions

$$f(t) = \begin{cases} t, 0 < t < 1 \\ 0, 1 < t < 1 \end{cases}$$

(e) Find the Laplace transform of the following unit step function

$$f(t) = \begin{cases} \cos t, 0 < t < \pi \\ \sin t,\quad t > \pi \end{cases}$$

OR

$$f(t) = \sin t\, u\left(t - \frac{\pi}{2}\right) - u\left(t - \frac{3\pi}{2}\right)$$

(f) Solve the differential equation using Laplace transform

$$\frac{d^2x}{dt^2} + 9x = \cos 2t \text{ if } x(0) = 1 \text{ and } x\left(\frac{\pi}{2}\right) = -1$$

[3+3+5+5+4+5]