Total No. of Questions : 09] [Total No.of Pages : 02

I/IV B. Tech. DEGREE EXAMINATIONS, DECEMBER - 2016

Second Semester

BT / CSE / ECE / EEE

MATHEMATICS - II

Time : **Three Hours** Maximum Marks : **60**

Answer Question No. 1 Compulsory. 12x1=12 M

Answer ONE question from each Unit. 4x12=48 M

1. a) Define exact differential equation.

   b) State Newton's Law of Cooling.

   c) Find I.F. for $\frac{dy}{dx}+\frac{y}{x}=x^2$.

   d) Write down C.F. when the roots are 2, 3 for $f(0)$. y = Q.

   e) Solve $(D^2-1)\, y = 0$.

   f) Find P.I. when $y = \frac{e^{2x}}{(D-2)^2}$.

   g) Write down necessary and sufficient condition for Laplace transform.

   h) Define Unit step function.

   i) Write down Laplace transform of periodic function.

   j) Define gradient of scalar point function.

   k) Find Curl $\bar{r}$, where $\bar{r}$ = xi+yj+zk.

   l) Define irrotational vector.

UNIT - I

2. a) Solve $(y^2-2xy)dx = (x^2-2xy)dy$.

   b) P.T. the system of parabolas $y^2 = 4a\,(x+a)$ is self - orthogonal.

(OR)

3. a) Solve $x\frac{dy}{dx}+y = x^3 y^6$.

   b) If the air is maintained at 15^oC and the temperature of the body drops from 70^o to 40^oC in 10 min. What will be its temperature after 30 min.

P.T.O.

UNIT - II

4. a) Solve $y^{11}-4y^{1}+3y = 4e^{3x}$, $y(0) = -1$, $y^{1}(0) = 3$.

   b) Solve $(D^2+4) \cdot y = \text{Tan}2x$ using variation of parameters.

(OR)

5. a) Solve $(D^2+3D+2)\, y = e^{-x} + x^2 + \text{Cos}x$.

   b) Solve $(D^2+4D+4)\, y = e^{-2x}$.

UNIT - III

6. a) Define unit step function and unit impulse function and find their Laplace transforms.

   b) Evaluate $L^{-1}\left(\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right)$ using Convolution theorem.

(OR)

7. a) Find $L(e^{3t} + \sin 2t + \text{Cos}3t + \text{Sinh}3t + \text{Cosh}2t + t^3)$.

   b) Solve $(D^2+4D+3)\, y = e^{-t}$, $y(0) = 1$, $y^{1}(0) = 1$ using Laplace transform.

UNIT - IV

8. a) Find the values of 'a' and 'b' so that the surfaces $ax^2-byz = (a+2)\,x$ and $4x^2y+z^3 = 4$ may intersect orthogonally at (1,-1,2).

   b) Verify Stokes theorem for $\overline{f} = x^2 i + xyj$ integrated round the square in the plane $z = 0$ whose sides are along the lines $x = 0$, $y = 0$, $x = a$, $y = a$.

(OR)

9. a) P.T. $\nabla^2 (\log r) = \frac{1}{r}$, where $\bar{r} = x\bar{i} + y\bar{j} + z\bar{k}$, $r = |\bar{r}|$.

   b) Find the work done by $f = (2x-y-z)\,\bar{i} + (x+y-z)\,\bar{j} + (3x-2y-5z)\,\bar{k}$ along a curve 'C' in the XY-plane given by $x^2 + y^2 = 9$, $z = 0$.

Total No. of Questions : 09] [Total No.of Pages : 02

I/IV B. Tech. DEGREE EXAMINATIONS, APRIL / MAY - 2016

SECOND SEMESTER

BT / CSE / ECE / EEE

MATHEMATICS - II

Time : **Three Hours** Maximum Marks : **60**

Answer Question No. 1 Compulsory. 12x1=12 M

Answer ONE question from each Unit. 4x12=48 M

1. a) Define Orthogonal Trajectory.

   b) Solve $y\,dx - x\,dy = 0$.

   c) State Law of Natural growth (or) decay.

   d) Write a formula of variation of parameters.

   e) Write down C.F. for f(0) y = ϕ when the roots are 2, 3, 4.

   f) Solve $(D^2-1)\,y = 0$.

   g) What is the Laplace transform of t ?

   h) State convolution theorem for Laplace transform.

   i) Define unit step function.

   j) Define solenoidal vector point function.

   k) Find div$\bar{f}$ where $\bar{f} = xyi+yzj+zxk$.

   l) State Green's theorem.

UNIT - I

2. a) Solve $y\,(2xy + e^x)\,dx - e^x\,dy = 0$.

   b) In a chemical reaction a given substance is being converted into another at a rate proportional to the amount has been unconverted. If $\left(\frac{1}{5}\right)^{th}$ of the original amount has been transformed in 4 min, how much time will be required to transform one half.

(OR)

3. a) Show that the system of rectangular hyperbolas $x^2-y^2=c^2$, $xy = c^2$ are mutually orthogonal.

   b) Solve $\frac{dy}{dx}+y\cos x=y^3\sin 2x$.

UNIT - II

4. a) Solve $(D^2+1)\,y = \cos(2x-1)$.

   b) Solve $(D^2+3D+2)\,y = e^{-x} + x^2 + \cos x$.

(OR)

5. a) Solve $(D^2+4)\,y = \tan 2x$. Using variation of parameters.

   b) Solve $(D^2+4D+4)\,y = e^{-2x}$.

UNIT - III

6. a) Find the Laplace transform of $t.e^{-t}.\sin t$.

   b) Solve $(D^2+1)\,y = 6\cos 2t$, $y(0) = 3$, $y^1(0) = 1$ using Laplace transform.

(OR)

7. a) Find $L^{-1}\left(\dfrac{s}{(s^2+a^2)^2}\right)$.

   b) Find $L^{-1}\left(\dfrac{s}{(s^2+a^2)^2}\right)$ using convolution theorem.

UNIT - IV

8. a) Find $\operatorname{div}\bar{f}$ where $\bar{f} = \text{grad}\,(x^3+y^3+z^3-3xyz)$

   b) Evaluate $\iint_S \bar{f}\,.\,\overline{ds}$ where $\bar{f} = yzi+2y^2j+xz^2k$ and 'S' is the surface of the cylinder $x^2+y^2=9$ contained in the first octant between the planes z=0 and z= 2.

(OR)

9. a) P.T. $\nabla.\dfrac{\bar{r}}{r^3} = 0$ where $\bar{r} = xi+yj+zk$, $r = |\bar{r}|$.

   b) Verify Green's theorem for $\int_C (xy+y^2)\,dx + x^2\,dy$ where 'C' is bounded by $y = x$ and $y = x^2$.