SIDDHARTH GROUP OF INSTITUTIONS:: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: MATHEMATICS-III (18HS0834) **Branch**:B.Tech(ECE)
Year &Sem: II-B.Tech&I-Sem **Regulation:**R18

UNIT –I
NUMERICAL METHOD -I

1.a) Write the formula to find the root of an equation by Regula Falsi method [2M]
b) Write Simpson formulae [2M]
c) Write the formula to find a cube root of a number by Newton Raphson's method [2M]
d) Evaluate $\Delta \tan^{-1} x$ [2M]
e) Construct a forward difference table for the function y = x^3 for x = 0, 1,2,3,4,5. [2M]

2 .Find a positive rootof$x^3 - x - 1 = 0$ correct to two decimal places by Bisection method. [10 M]

3. Find out the root of the equation $x\log_{10}(x) = 1.2$usingFalsepositionmethod. [10 M]

4. Find the root of the equation $xe^x = 2$ Using Regula-falsi method. [10 M]

5. Find a real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson method. [10 M]

6. Using Newton-Raphson Method
(i) Find square root of 28. **(ii)**Find cube rootof 15. [10 M]

7. From the following table values of$x$and $y = \tan x$ interpolate values of y when $x = 0.12$ *and* $x = 0.28$ [10 M]

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

8. a) Using Newton's forward interpolation formula and the given table of values

x	1.1	1.3	1.5	1.7	1.9
f(x)	0.21	0.69	1.25	1.89	2.61

Obtain the value of f(x) when x=1.4 [5M]

b) Use Newton's backward interpolation formula to find$f(32)$
given$f(25) = 0.2707$, $f(30) = 0.3027$ $f(35) = 0.3386$, $f(40) = 0.3794$ [5M]

9. Evaluate $\int_0^1 \frac{1}{1+x}dx$ **(i)**By trapezoidal rule and Simpson's $\frac{1}{3}$ rule [5M]

(ii) Using Simpson's $\frac{3}{8}$ rule and compare the result with actual value [5M]

10. a) Compute $\int_0^4 e^x dx$ by Simpson's $\frac{1}{3}$ rule with 10 sub divisions. [5M]

b) Compute $\int_3^7 x^2 \log x dx$ using trapezoidal rule and Simpson's rule by taking 10 sub divisions. [5M]

[Type text]

SIDDHARTH GROUP OF INSTITUTIONS: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: MATHEMATICS-III (18HS0834) **Branch**: B.Tech (ECE)
Year &Sem: II-B.Tech& I-Sem **Regulation:** R18

UNIT –II

NUMERICAL METHOD-II

1. a)write R-K method of 4th order formula [2M]
   b)write the diagonal five-point formula [2M]
   c)write the Taylor's series solution of $y' = -xy$, y(0)=1upto x^4 [2M]
   d) Write the standard five-point formula [2M]
   e)Use Euler's method to find y(0.1) given $y' = (x^3 + xy^2)e^{-x}, y(0) = 1$ [2M]

5]
M

- [

2 a) tabulate y (0.1), y (0.2), and y (0.3) using Taylor's series method given that [5M]
$y^1 = y^2 + x$ And y (0) = 1

b)Using Euler's method, find an approximate value of y corresponding to $x = 1$ given that $\frac{dy}{dx} = x + y$

and $y = 1$ when $x = 0$. [5M]

[5M]

3 Using Taylor's series method find an approximate value of y at x = 0.2 for the D.E
$y^1 - 2y = 3e^x$, y(0) = 0. Compare the numerical solution obtained with exact solution. [10M]

4a) Solve $y^1 = x + y$, given y (1)=0 find y(1.1) and y(1.2) by Taylor's series method [5M]
b) Solve by Euler's method [5M]
$\frac{dy}{dx} = \frac{2y}{x} given\ y(1) = 2 and\ find\ y(2).$

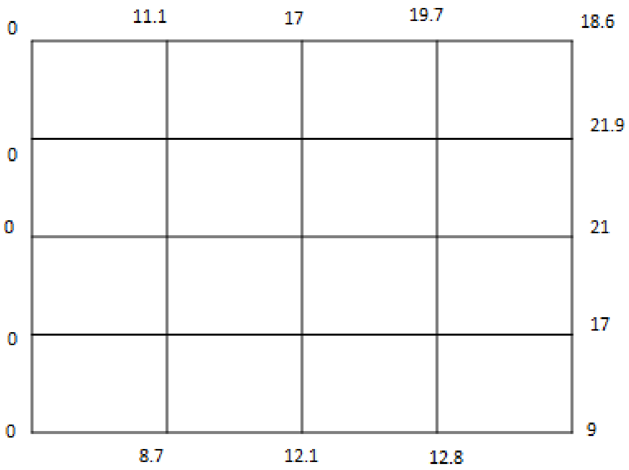
5. Using R-K method of 4thorder , solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, y(0)=1 Find y(0.2) and y(0.4) [10 M]

6. Using R-K method of 4th order find y(0.1),y(0.2) and y(0.3) given that $\frac{dy}{dx} = 1 + xy, y(0) = 2$ [10M]

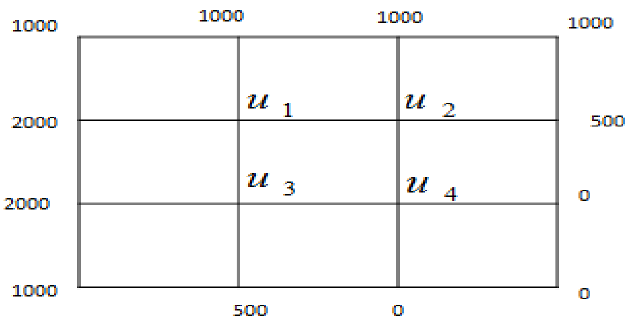
7. A) Using Runge-Kutta method of fourth order, compute y(0.2) from $y^1 = xy$
y (0)=1, taking h=0.2 [5M]
b) Using Euler's method $y' = y^2 + x$, y(0)=1. Find y(0.1) and y(0.2) [5M]

8) Solve $y'' - x(y')^2 + y^2 = 0$ using R-K method of 4th order for $x = 0.2$ given y(0) = 1, $y^1(0)$=0 taking h=0.2 [10M]

9) Solve the Laplace Equation $u_{xx} + u_{yy} = 0$ given that, [10M]



10) Evaluate the function u(x, y) satisfying $\nabla^2 u = 0$ at the pivotal points given the boundary values as follows:



[10M]

SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code: MATHEMATICS-III(18HS0834) **Branch**: B.Tech (ECE)
Year &SEM: II-B.Tech& I-Sem **Regulation:** R18

TRANSFORMS CALCULUS-I

UNIT-III

1. a) Find the Laplace transform of $e^{at}\cosh bt$ [2 M]
   b) Find the Laplace transform of $3\cos 3t.\cos 4t$ [2M]

c) Find $L^{-1}\left\{\dfrac{2s-5}{4s^2+25}\right\}$ by using linear property. [2 M]

d) Find $L\{t^2+3t+10\}$ [2M]

e) State Convolution theorem. [2M]

2. a) Find the Laplace transform of $e^{-3t}\left(2\cos 5t-3\sin 5t\right)$ [5M]

b) Find the Laplace transform of $f(t)=\int_0^t e^{-t}\cos t\,dt$. [5M]

3. a) Find the Laplace transform of $f(t)=\dfrac{1-\cos at}{t}$ [5 M]

b) Show that $\int_0^\infty t^2 e^{-4t}.\sin 2t\,dt=\dfrac{11}{500}$, Using Laplace transform [5 M]

4. a)Find the Laplace Transform of Square-wave function of period 2a,

Defined as $f(t)=\begin{cases} k, & 0<t<a \\ -k, & a<t<2a \end{cases}$ [5 M]

b) Using Laplace transform, evaluate $\int_0^\infty \dfrac{\cos at-\cos bt}{t}dt$. [5 M]

5. a) Find the Laplace transform of $f(t)=e^{-4t}\int_0^t \dfrac{\sin 3t}{t}dt$. [5 M]

b) Find the Laplace transform of $f(t)=t\ e^{2t}\sin 3t$ [5 M]

6. a) Find $L^{-1}\left\{\dfrac{3s-2}{s^2-4s+20}\right\}$ by using first shifting theorem. [5M]

b) Find $L^{-1}\left\{\dfrac{1}{2}\log\left(\dfrac{s^2+a^2}{s^2+b^2}\right)\right\}$ [5M]

7. a) Find $L^{-1}\left\{\dfrac{1}{\left(s^2+5^2\right)^2}\right\}$,using Convolution theorem. [5 M]

b) Find $L^{-1}\left\{\dfrac{s^2}{\left(s^2+4\right)\left(s^2+25\right)}\right\}$,using Convolution theorem. [5M]

8. a) Find the Inverse Laplace transform of $\frac{1}{s^2\left(s^2+a^2\right)}$. [5 M]

   b) Find $L^{-1}\left\{\log\left(\frac{s-1}{s+1}\right)\right\}$ [5 M]

9. Using Laplace transform method to solve $y^{11}-3y^1+2y=4t+e^{3t}$ where $y(0)=1, y^1(0)=1$ [10M]

10. Solve the D.E $\frac{d^2x}{dt^2}+9x=\sin t$ using Laplace Transform given that $x(0)=1, x\left(\frac{\pi}{2}\right)=1$ [10M]

UNIT – IV

TRANSFORMS CALCULUS-II

1. a) Define Fourier sine and cosine transforms [2M]

   b) Find the Fourier sine transform of $\frac{1}{x}$ [2M]

   c) Define the inverse Fourier sine and cosine transforms [2M]

   d) Find the Fourier cosine transform of e^{-ax}, $a > 0$ and hence deduce the Inverse formula [2M]

   e) Find the finite Fourier sine transform of $f(x) = 2x, 0 < x < 4$. [2M]

2. a) Express f(x) = $\begin{Bmatrix} 1, 0 \le x \le \pi \\ 0, x > \pi \end{Bmatrix}$ as a Fourier sine integral and hence evaluate

   $$\int_0^\infty \frac{1-\cos(\pi\lambda)}{\lambda}\sin(x\lambda)d\lambda$$ [5M]

   b) Prove that (i) F_s {a f(x) + b g(x) }= a F_s(p) + bG_s(p)

   (ii) F_c {a f(x) + b g(x) }= a F_c(p) + bG_c(p) [5M]

3 . a) Prove that F[x^n f(x)] = $(-i)^n \frac{d^n}{dp^n}[F(p)]$ [5M]

   b) Prove that F_s { x f(x) } = $-\frac{d}{dp}[F_c(p)]$ [5M]

4. Find the Fourier transform of f(x) = $\begin{Bmatrix} a^2 - x^2, |x| < a \\ 0, |x| > a > 0 \end{Bmatrix}$ Hence show that

   $$\int_0^\infty \frac{\sin x - x\cos x}{x^3}dx = \frac{\pi}{4}.$$ [10M]

5. a)Find the Fourier transform of f(x) =. $e^{-\frac{x^2}{2}}, -\infty < x < \infty$ [5M]

   b) If F(p) is the complex Fourier transform of f(x) , then prove that the complex Fourier transform of f(x) cos ax is $\frac{1}{2}[F(p+a) + F(p-a)]$ [5M]

6. a) Find the Fourier cosine transform of $e^{-ax}\cos ax, a > 0$ [5M]

   b) Find the Fourier cosine transform of f(x) = $\begin{Bmatrix} x, \text{ for } 0 < x < 1 \\ 2 - x, \text{ for } 1 < x < 2 \\ 0, \text{ for } x > 2 \end{Bmatrix}$ [5M]

7. Find the Fourier sine and cosine transforms of f(x)=$\frac{e^{-ax}}{x}$ and deduce that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}\sin sx\, dx = \tan^{-1}\left(\frac{s}{a}\right) - \tan^{-1}\left(\frac{s}{b}\right)$. [10M]

8. Find the Fourier sine and cosine transforms of f(x)= $e^{-ax}, a > 0$ and hence deduce the integrals

   (i) $\int_0^\infty \frac{p\sin px}{a^2+p^2}dp$ (ii) $\int_0^\infty \frac{\cos px}{a^2+p^2}dp$ [10M]

9. Find the inverse Fourier sine transform of f(x) of $F_s(\text{p}) = \dfrac{p}{1+p^2}$

[10M]

10.a) Find the finite Fourier sine transform of f(x),defined by $\left\{\begin{array}{l} x,\ 0 \le x \le \dfrac{\pi}{2} \\ \pi - x,\ \dfrac{\pi}{2} \le x \le \pi \end{array}\right\}$

[5M]

b) Find the inverse finite Fourier sine transform of f(x),If $F_s(\text{n}) = \dfrac{16(-1)^{n-1}}{n^3}$, where n is a Positive integer and 0 < x < 8.

[5M]

[Type text]

SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583
QUESTION BANK (DESCRIPTIVE)

Subject with Code :MATHEMATICS-III(18HS0834) **Branch**: B.Tech(ECE)
Year &Sem: II-B.Tech& I-Sem **Regulation:** R18

UNIT –V
PARTIAL DIFFERENCIAL EQUATIONS

1. a) Solve $xp+yq=3z.$ [2 M]
b) Solve $r+6s+9t=0.$ [2 M]
c) Solve $p(1+q)=qz..$ [2 M]
d) Solve $\frac{\partial^3 z}{\partial x^3}-4\frac{\partial^3 z}{\partial x^2\partial y}+4\frac{\partial^3 z}{\partial x\partial y^2}=0.$ [2 M]
e) Find the particular integral of the equation $4r+12s+9t=e^{3x-2y}.$ [2 M]

2. a) Solve $(x^2-y^2-z^2)p+2xyq=2xz.$ [5 M]
b) Solve $(z-y)p+(x-z)q=y-x.$ [5 M]

3. a) Solve $x(y-z)p+y(z-x)q=z(x-y).$ [5 M]
b) Solve $x^2(y-z)p+y^2(z-x)q=z^2(x-y).$ [5 M]

4. a) Solve $p^2+q^2=x+y.$ [5 M]
b) Solve $z^2(p^2x^2+q^2)=1.$ [5 M]

5. a) Solve $r-4s+4t=e^{2x+y}.$ [5 M]
b) Solve $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial x\partial y}-6\frac{\partial^2 z}{\partial y^2}=\cos(2x+y).$ [5 M]

6. a) Solve $(D^2+3DD'+2D'^2)z=24xy.$ [5 M]
b) Solve $\frac{\partial^3 z}{\partial x^3}-2\frac{\partial^3 z}{\partial x^2\partial y}=2e^{2x}+3x^2y.$ [5 M]

7. a) Solve $(D^2+2DD'+D'^2-2D-2D')z=\sin(x+2y).$ [5 M]
b) Solve $(D-D'-1)(D-D'-2)=e^{2x-y}.$ [5 M]

8. A tightly stretched string of length *l* with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity$b\sin^3\left(\frac{\pi x}{l}\right)$. Find the displacement *y(x, t)*. [10 M]

9. A tightly stretched string with fixed end points *x=0* and *x=l* is initially at rest in its equilibrium position. It is set vibrating by giving each point a velocity$kx(l-x)$. Find the displacement of the string at any distance *x* from one end at any time *t*. [10 M]

10. A homogeneous rod of conducting material of length 100cm has its ends kept at zero temperature and the temperature initially is $u(x,0)=x, \quad 0\le x\le 50$
$=100-x, \quad 50\le x\le 100$
Find the temperature *u(x, t)* at any time. [10 M]