Course Code: 19HS0832 **R19**

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

QUESTION BANK (DESCRIPTIVE)

Subject with Code: PROBABILITY, NUMERICAL METHODS AND TRANSFORMS (19HS0832)
Course & Branch: B.Tech - EEE

Year &Sem: II-B.Tech. & I-Sem. **Regulation:** R19

UNIT -I
PROBABILITY

1. a)	A class consists of 6 girls and 10 boys. If a committee of 3 is chosen at random from the class, find the Probability that (i) 3 boys are selected (ii) Exactly 2 girls are selected.	[L1][CO1]	**[6M]**
b)	Two cards are selected at random from 10 cards numbered 1 to 10. Find the probability that the sum is even if (i) The two cards are drawn together. (ii) The two cards drawn one after other with replacement.	[L1][CO1]	**[6M]**
2. a)	In a group there are 3men and 2 women. Three persons are selected at random from this group. Apply the probability that one man and two women or two men and one women are selected.	[L3][CO1]	**[6M]**
b)	Five persons in a group 20 are engineers. If three persons are selected at random, determine the probability that all engineers and the probability that at least one being an engineer.	[L5][CO1]	**[6M]**
3. a)	Out of 15 items 4 are not in good condition 4 are selected at random. Apply the probability that (i) All are not good (ii) Two are not good	[L3][CO1]	**[6M]**
b)	Three students A, B, C are in running race. A and B have the same Probability of winning and each is twice as likely to win as C. Find the Probability that B or C wins.	[L1][CO1]	**[6M]**
4. a)	From a city 3 news papers A, B, C are being published. A is read by 20%, B is read by 16%, C is read by 14% both A and B are read by 8%, both A and C are read by 5% both B and C are read by 4% and all three A,B,C are read by 2%. Find out the percentage of the population that read at least one paper	[L1][CO1]	**[6M]**
b)	What is the probability that a card drawn at random from the pack of playing cards may be either a queen or a king?	[L1][CO1]	**[6M]**
5. a)	A class has 10 boys and 5 girls. Three students are selected at random one after another. Use the probability for (i) First two are boys and third is girl. (ii) First and third are of same sex and the second is of opposite sex.	[L3][CO1]	**[6M]**
b)	Two marbles are drawn in succession from a box containing 10 red, 30 white, 20 blue and 15 orange marbles, with replacement being made after each draw. Find the probability that (i) Both are white (ii) First is red and second is white.	[L1][CO1]	**[6M]**
6. a)	In a certain town 40% have brown hair, 25% have brown eyes and 15% have both brown hair and brown eyes. A person is selected at random from the town. i) If he has brown hair, determine the probability that he has brown eyes also? ii)If he has brown eyes, determine the probability that he does not have brown hair?	[L5][CO1]	**[8M]**
b)	The probability that students A, B, C, D solve the problem are $\frac{1}{3}, \frac{2}{5}, \frac{1}{5}$ and $\frac{1}{4}$ respectively If all of them try to solve the problem, what is the probability that the problem is solved.	[L1][CO1]	**[4M]**
7.	Two dice are thrown. Let A be the event that the sum of the point on the faces is 9. Let B be the event that at least one number is 6. Find (i) $P(A\cap B)$ (ii) $P(A\cup B)$ (iii) $P(A^c\cup B^c)$ (iv) $P(A^c\cap B^c)$ (v) $P(A^c\cap B)$	[L1][CO1]	**[6M]**

8. a)	Determine (i) $P\left(B/A\right)$ (ii) $P\left(A/B^C\right)$ if A and B are events with $P(A)=\frac{1}{3}$, $P(B)=\frac{1}{4}$, $P(A\cup B)=\frac{1}{2}$.	[L5][CO1]	**[6M]**
b)	A businessman goes to hotel X, Y, Z, 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbing what is the probability that businessman's room having faulty plumbing is assigned to hotel Z	[L1][CO1]	**[6M]**
9.	In a certain college 25% of boys and 10% of girls are studying mathematics. The girls Constitute 60% of the student body. (a) What is the probability that mathematics is being studied? (b) If a student is selected at random and is found to be studying mathematics, find the probability that the student is a girl (c) a boy.	[L1][CO1]	**[12M]**
10.	In a bolt factory machines A, B, C manufacture 20%,30% and 50% of the total of their output and 6%,3% and 2% are defective. A bolt is drawn at random and found to be defective. Find the probabilities that it is manufactured from (i) Machine A (ii)Machine B (iii) Machine C	[L1][CO1]	**[12M]**

UNIT –II

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS & INTERPOLATION

1.	By using Bisection method to find the square root of 25, when $\boldsymbol{x_0 = 2.0,\ x_1 = 7.0}$	[L3][CO2]	**[12M]**
2.	By applying Bisection method to find a positive root of $x^3 - x - 1 = 0$ correct to two decimal places.	[L3][CO2]	**[12M]**
3.	Find a positive root of $f(x)=e^x - 3$ correct to two decimal places by Bisection method.	[L1][CO2]	**[12M]**
4.	Find a real root of the equation $xe^x - \cos x = 0$ using Newton – Raphson method.	[L1][CO2]	**[12M]**
5.	Using Newton-Raphson method (i) Find square root of 28 (ii) Find cube root of 15	[L3][CO2]	**[12M]**
6. a)	Using Newton-Raphson method to value the reciprocal of 12	[L3][CO2]	**[6M]**
b)	Find a real root of the equation $x\tan x + 1 = 0$ using Newton – Raphson method.	[L1][CO2]	**[6M]**
7.	Determine the root of the equation $x\log_{10}(x)=1.2$ using False position method.	[L5][CO2]	**[12M]**
8	What is the root of the equation $xe^x = 2$ using Regula-falsi method.	[L1][CO2]	**[12M]**
9	From the following table values of x and $y=\tan x$. Find the values of y when $x=0.12$ and $x=0.28$.	[L1][CO2]	**[12M]**

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

10. a)	Using Newton's forward interpolation formula and the given table of values	[L3][CO2]	**[6M]**

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 $x=1.4$.

b)	Use Newton's backward interpolation formula to find $f(32)$ given $f(25)=0.2707$, $f(30)=0.3027$, $f(35)=0.3386$, $f(40)=0.3794$.	[L3][CO2]	**[6M]**

UNIT –III

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS & NUMERICAL INTEGRATION

1.	Tabulate y(0.1), y(0.2) and y(0.3) using Taylor's series method given that $y^1 = y^2 + x$ and y(0) = 1	[L2][CO3]	**[12M]**
2.	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.	[L3][CO3]	**[12M]**
3. a)	Solve $y^1 = x + y$, given y (1)=0 find y(1.1) and y(1.2) by Taylor's series method.	[L3][CO3]	**[6M]**
b)	Solve by Euler's method $\frac{dy}{dx} = \frac{2y}{x}$ given y(1)=2 and find y(2)	[L3][CO3]	**[6M]**
4.	Applying Euler's method, find an approximate value of y corresponding to $x = 1$ given that $\frac{dy}{dx} = x + y$ and $y = 1$ when $x = 0$ taking step size h=0.1	[L3][CO3]	**[12M]**
5. a)	Using Euler's method $y^l = y^2 + x$, y(0)=1. Find y(0.1) and y(0.2)	[L3][CO3]	**[6M]**
b)	Using Runge–Kutta method of fourth order, compute y(0.2) from $y^1 = xy$ y(0)=1, taking h=0.2	[L3][CO3]	**[6M]**
6.	Using R-K method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, y(0)=1. Find y(0.2) and y(0.4).	[L3][CO3]	**[12M]**
7.	Using R-K method of 4th order find y(0.1), y(0.2) and y(0.3) given that $\frac{dy}{dx} = 1 + xy,\ y(0) = 2$.	[L3][CO3]	**[12M]**
8.	Solve $y'' - x(y')^2 + y^2 = 0$ using R-K method of 4th order for $x = 0.2$ given y(0) = 1, And $y^1(0)=0$ taking h=0.2	[L6][CO3]	**[12M]**
9.	Evaluate $\int_0^1 \frac{1}{1+x} dx$ (i) by Trapezoidal rule and Simpson's $\frac{1}{3}$ rule. (ii) Using Simpson's $\frac{3}{8}$ rule and compare the result with actual value.	[L5][CO3]	**[12M]**
10. a)	Calculate $\int_0^4 e^x dx$ by Simpson's $\frac{3}{8}$ rule with 12 sub divisions.	[L3][CO3]	**[6M]**
b)	Evaluate $\int_3^7 x^2 \log x dx$ using Trapezoidal rule and Simpson's $\frac{1}{3}$ rule by taking 10 sub divisions.	[L5][CO3]	**[6M]**

Course Code: 19HS0832 **R19**

UNIT –IV
LAPLACE TRANSFORMS

1. a)	Determine the Laplace transform of $f(t) = e^{3t} - 2e^{-2t} + sin2t + cos3t + sinh3t - 2cosh4t + 9$.	[L5][CO4]	**[6M]**
b)	Find the Laplace transform of $f(t) = cosh\ at\ sin\ bt$	[L1][CO4]	**[6M]**
2. a)	Value the Laplace transform of $f(t) = \left(\sqrt{t} + \frac{1}{\sqrt{t}}\right)^3$.	[L5][CO4]	**[6M]**
b)	Find the Laplace transform of $f(t) = e^{4t} sin2t\ cost$.	[L1][CO4]	**[6M]**
3. a)	Find the Laplace transform of $f(t) = t^2 e^{2t} \sin 3t$	[L1][CO4]	**[6M]**
b)	Find the Laplace transform of $f(t) = \dfrac{1-\cos at}{t}$	[L1][CO4]	**[6M]**
4. a)	What is the Laplace transform of $f(t) = \int_0^t e^{-t} \cos t\, dt$?	[L1][CO4]	**[6M]**
b)	What is the Laplace transform of $f(t) = e^{-4t} \int_0^t \frac{\sin 3t}{t} dt$.	[L1][CO4]	**[6M]**
5. a)	Show that $\int_0^\infty t^2 e^{-4t}.\sin 2t\, dt = \frac{11}{500}$, Using Laplace transform.	[L4][CO4]	**[6M]**
b)	Using Laplace transform, evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t} dt$.	[L3][CO4]	**[6M]**
6. a)	Find $L^{-1}\left\{\frac{3s-2}{s^2-4s+20}\right\}$ by using first shifting theorem.	[L1][CO4]	**[6M]**
b)	Find $L^{-1}\left\{\log\left(\frac{s-a}{s-b}\right)\right\}$	[L1][CO4]	**[6M]**
7. a)	Determine $L^{-1}\left\{\frac{1}{(s^2+5^2)^2}\right\}$,using Convolution theorem.	[L5][CO4]	**[6M]**
b)	Evaluate $L^{-1}\left\{\frac{s^2}{(s^2+\ 4)\ (s^2+25)}\right\}$, using Convolution theorem.	[L5][CO4]	**[6M]**
8. a)	Find the Inverse Laplace transform of $\frac{1}{s(s^2+a^2)}$	[L1][CO4]	**[6M]**
b)	Find $L^{-1}\left\{s\log\left(\frac{s-1}{s+1}\right)\right\}$	[L1][CO4]	**[6M]**
9.	Applying Laplace transform method to solve $y^{11} - 3y^1 + 2y = 4t + e^{3t}$ where $y(0) = 1, y^1(0) = 1$	[L3][CO4]	**[12M]**
10.	Solve the D.E. $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + x = 3te^{-t}$ using Laplace Transform given that $x(0) = 4; \frac{dx}{dt} = 0.at, t = 0$	[L6][CO4]	**[12M]**

Course Code: 19HS0832 **R19**

UNIT –V
Z - TRANSFORMS

1. a)	Applying linearity property, find the Z –transforms of the following functions (i) an^2+bn+c (ii) $(n-1)^2$	[L3][CO5]	**[6M]**
b)	Determine the value of $Z\left[(-2)^n\right]$	[L5][CO5]	**[6M]**
2. a)	Find $Z\left\{\dfrac{1}{n(n+1)}\right\}$	[L1][CO5]	**[6M]**
b)	Find Z –transform of the following (i) e^{-an} (ii) ne^{-an} (iii) n^2e^{-an} (iv) na^n	[L1][CO5]	**[6M]**
3. a)	Calculate the value of $Z\left\{\dfrac{1}{(n+2)(n+1)}\right\}$	[L3][CO5]	**[6M]**
b)	Find $Z\left\{\dfrac{1}{(n+2)(n-1)}\right\}$	[L1][CO5]	**[6M]**
4.	Determine the value of Z(cosnt) and Z(sinnt). Hence find (i) Z(n cosnt) (ii) Z(n sinnt)	[L5][CO5]	**[12M]**
5. a)	If f(z)= $\dfrac{5z^2+3z+12}{(z-1)^4}$,What are the values of f(2) and f(3)?	[L1][CO5]	**[6M]**
b)	If Z $Z\left[f(n)\right]=\dfrac{z}{z-1}+\dfrac{z}{z^2+1}$, find $Z\left[f(n+2)\right]$	[L1][CO5]	**[6M]**
6. a)	Evaluate $Z^{-1}\left[\dfrac{z^2}{(z-1)(z-3)}\right]$, Using Convolution theorem.	[L5][CO5]	**[6M]**
b)	Compute the value of $Z^{-1}\left[\left(\dfrac{z}{z-a}\right)^2\right]$, Using Convolution theorem.	[L3][CO5]	**[6M]**
7. a)	Find $Z^{-1}\left[\dfrac{z}{z^2+11z+24}\right]$	[L1][CO5]	**[6M]**
b)	Find the inverse Z –transform of $\dfrac{2z^2+3z}{(z+2)(z-4)}$	[L1][CO5]	**[6M]**
8. a)	Give the value of $Z^{-1}\left[\dfrac{z}{z^3-7z^2+14z-8}\right]$	[L1][CO5]	**[6M]**
b)	Find $Z^{-1}\left[\dfrac{1}{(z-\frac{1}{2})(z-\frac{1}{3})}\right]$ if $\frac{1}{3}\angle\lvert z\rvert\angle\frac{1}{2}$	[L1][CO5]	**[6M]**
9	Solve $y_{n+2}+2y_{n+1}+y_n=n$. Using the Z –transform given that $y_0=y_1=0$	[L6][CO5]	**[12M]**
10	Applying the Z –transform, solve $y_{n+2}-6y_{n+1}+8y_n=2^n+6n$	[L3][CO5]	**[12M]**

Prepared by:
Dept. of Mathematics