Course Code: 20HS0832 **R20**

SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code: PROBABILITY,NUMERICAL METHODS AND TRANSFORMS (20HS0832)
Course & Branch: B.Tech - EEE
Year &Sem: II-B.Tech. & I-Sem. **Regulation:** R20

UNIT -I
PROBABILITY

1.a)	Define probability?	[L1][CO1]	**[2M]**
b)	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]	**[5M]**
c)	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]	**[5M]**
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)	Write axioms of probability.	[L3][CO1]	**[2M]**
b)	Out of 15 items 4 are not in good condition 4 are selected at random. Find the probability that (i)All are not good (ii)Two are not good	[L3][CO1]	**[5M]**
c)	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]	**[5M]**
4.a)	State and prove additional probability theorem.	[L1][CO1]	**[6M]**
b)	From a city 3 newspapers 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]**
5.a)	A class has 10 boys and 5 girls. Three students are selected at random one after another. Find the probability that (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)	Define conditional probability.	[L5][CO1]	**[2M]**
b)	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]	**[6M]**

c)	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.a)	State Multiplication theorem.	[L1][CO1]	**[2M]**
b)	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]	**[10M]**
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.a)	State Baye's theorem.	[L1][CO1]	**[2M]**
b)	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]	**[10M]**

UNIT –II

NUMERICAL SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS&INTERPOLATION

<table>
<tr><td>1.a)</td><td>Explain Briefly Bisection Method.</td><td>[L5][CO2]</td><td>[4M]</td></tr>
<tr><td>b)</td><td>By using Bisection method to find the square root of 25,when$x_0 = 2.0, \ x_1 = 7.0$</td><td>[L3][CO2]</td><td>[8M]</td></tr>
<tr><td>2.</td><td>By applying Bisection method to find a positive root of $x^3 – x – 1 = 0$ correct to two decimal places.</td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>3.</td><td>Find real root of the equation $3x=e^x$ by Bisection method.</td><td>[L1][CO2]</td><td>[12M]</td></tr>
<tr><td>4.a)</td><td>Write General Approximation formula for Newton-Raphson method</td><td>[L2][CO2]</td><td>[2M]</td></tr>
<tr><td>b)</td><td>Find a real root of the equation $xe^x – \cos x = 0$ using Newton – Raphson method.</td><td>[L1][CO2]</td><td>[10M]</td></tr>
<tr><td>5.</td><td>Using Newton-Raphson method (i)Find square root of 28
(ii)Find cube root of 15</td><td>[L3][CO2]</td><td>[12M]</td></tr>
<tr><td>6.a)</td><td>Using Newton-Raphson method to value the reciprocal of 12</td><td>[L3][CO2]</td><td>[6M]</td></tr>
<tr><td>b)</td><td>Find a real root of the equation $x\tan x+1=0$ using Newton – Raphson method.</td><td>[L1][CO2]</td><td>[6M]</td></tr>
<tr><td>7.</td><td>Determine the root of the equation $x\log_{10}(x)=1.2$usingFalsepositionmethod.</td><td>[L5][CO2]</td><td>[12M]</td></tr>
<tr><td>8a)</td><td>Write General Approximation formula for Regula-falsi method</td><td>[L2][CO2]</td><td>[2M]</td></tr>
<tr><td>b)</td><td>What is the root of the equation $xe^x= 2$ using Regula-falsi method.</td><td>[L1][CO2]</td><td>[10M]</td></tr>
<tr><td>9a)</td><td>Write Newton’s forward interpolation formula.</td><td>[L2][CO2]</td><td>[2M]</td></tr>
<tr><td>b)</td><td>From the following table values of x and $y=\tan x$. Find the values of y when $x=0.12$ and $x=0.28$.
<table>
<tr><td>x</td><td>0.10</td><td>0.15</td><td>0.20</td><td>0.25</td><td>0.30</td></tr>
<tr><td>y</td><td>0.1003</td><td>0.1511</td><td>0.2027</td><td>0.2553</td><td>0.3093</td></tr>
</table></td><td>[L1][CO2]</td><td>[10M]</td></tr>
<tr><td>10.a)</td><td>Using Newton’s forward interpolation formula and the given table of values
<table>
<tr><td>x</td><td>1.1</td><td>1.3</td><td>1.5</td><td>1.7</td><td>1.9</td></tr>
<tr><td>f(x)</td><td>0.21</td><td>0.69</td><td>1.25</td><td>1.89</td><td>2.61</td></tr>
</table>
Obtain the value of $f(x)$ when $x=1.4$</td><td>[L3][CO2]</td><td>[6M]</td></tr>
<tr><td>b)</td><td>Use Newton’s backward interpolation formula to find $f(32)$ given $f(25)=0.2707$, $f(30)=0.3027$,$f(35)=0.3386$, $f(40)=0.3794$.</td><td>[L3][CO2]</td><td>[6M]</td></tr>
</table>

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UNIT –III

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS& NUMERICAL INTEGRATION

1.a)	Write general approximation formula for Taylor's series.	[L2][CO3]	**[2M]**
b)	Tabulate y(0.1), y(0.2) and using Taylor's series method given that $y^1 = y^2 + x$ and y(0) = 1	[L2][CO3]	**[10M]**
2.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$\boldsymbol{\frac{dy}{dx} = x^2 - y}$, given y(0)=1 using Taylor's series method and find y(0.1) and y(0.2)	[L3][CO3]	**[6M]**
3.	Evaluate by Taylor's series method, find an approximate value of y at x=0.1and 0.2 for the D.E $y^{11} - x(y^1)^2 + y^2 = 0\ ; y(0) = 1\ , y^1(0) = 0$.	[L5][CO3]	**[12M]**
4.a)	Write general approximation formula for Euler's method	[L3][CO3]	**[2M]**
b)	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=0.2	[L3][CO3]	**[10M]**
5.a)	Solve by Euler's method $y' = y^2 + x$, y(0)=1.and find y(0.1) and y(0.2)	[L3][CO3]	**[6M]**
b)	Solve by Euler's method $\boldsymbol{\frac{dy}{dx} = \frac{2y}{x}}$ given y(1)=2 and find y(2)	[L3][CO3]	**[6M]**
6.	Using modified Euler's method find $y(0.2) and\ y(0.4),\ given\ y^1 = y + e^x\ , y(0) = 0$	[L3][CO4]	**[12M]**
7.a)	Write general approximation formula for R-K method of 4th order.	[L2][CO4]	**[2M]**
b)	Using R-K method of 4th order find y(0.1),y(0.2) and y(0.3) given that $\boldsymbol{\frac{dy}{dx} = 1 + xy,\ y(0) = 2}$.	[L3][CO4]	**[10M]**
8.	Using R-K method of 4th order find y(0.1) and y(0.2) given that $\frac{dy}{dx} = x + y, y(0) = 1$.	[L6][CO4]	**[12M]**
9.a)	State Trapezoidal rule	[L3][CO4]	**[2M]**
b)	Compute $\boldsymbol{\int_0^{\pi/2} sinx\, dx}$ using Trapezoidal rule, Simpson's $\frac{1}{3}$ ruleand compare with exact value	[L5][CO4]	**[5M]**
c)	Calculate $\int_0^4 e^x dx$ by Simpson's$\boldsymbol{\frac{3}{8}}$rule with 12 sub divisions.	[L3][CO4]	**[5M]**
10.	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][CO4]	**[12M]**

UNIT –IV
LAPLACE TRANSFORMS

1.a)	Define Laplace transform.	[L1][CO5]	**[2M]**
b)	Find the Laplace transform of $f(t)=e^{3t}-2e^{-2t}+sin2t+cos3t+sinh3t-2cosh4t+9$.	[L1][CO5]	**[5M]**
c)	Find the Laplace transform of $f(t)=cosh\,at\,sin\,bt$	[L1][CO5]	**[5M]**
2.a)	Find the Laplace transform of $f(t)=\left(\sqrt{t}+\frac{1}{\sqrt{t}}\right)^3$.	[L1][CO5]	**[6M]**
b)	Find the Laplace transform of $e^{-3t}(\cos 4t+3\sin 4t)$	[L1][CO5]	**[6M]**
3.a)	Define Unite step function?	[L1][CO5]	**[2M]**
b)	Find the Laplace transform of $3\cos 4(t-2)u(t-2)$	[L1][CO5]	**[5M]**
c)	Find $L\{e^{-3t}sinh3t\}$ using change of scale property.	[L3][CO5]	**[5M]**
4.a)	Find the Laplace transform of $f(t)=t^2e^{2t}\sin 3t$.	[L1][CO5]	**[6M]**
b)	Find the Laplace transform of $f(t)=\frac{1-\cos at}{t}$	[L1][CO5]	**[6M]**
5.a)	State Integral theorem.	[L1][CO5]	**[2M]**
b)	Find the Laplace transform of $f(t)=\int_0^t e^{-t}\cos t\,dt$.	[L1][CO5]	**[5M]**
c)	Find the Laplace transform of $f(t)=e^{-4t}\int_0^t \frac{\sin 3t}{t}dt$.	[L1][CO5]	**[5M]**
6.a)	Show that $\int_0^\infty t^2e^{-4t}.\sin 2t\,dt=\frac{11}{500}$, Using Laplace transform.	[L2][CO5]	**[6M]**
b)	Using Laplace transform, evaluate $\int_0^\infty \frac{\cos at-\cos bt}{t}dt$.	[L5][CO5]	**[6M]**
7.a)	Define Inverse Laplace transforms of derivative.	[L1][CO5]	**[2M]**
b)	Find $L^{-1}\left\{\frac{3s-2}{s^2-4s+20}\right\}$ by using first shifting theorem.	[L1][CO5]	**[5M]**
c)	Find $L^{-1}\left\{\log\left(\frac{s-a}{s-b}\right)\right\}$	[L1][CO5]	**[5M]**
8.a)	Find $L^{-1}\left\{\frac{3(s^2-2)^2}{2s^5}\right\}$	[L1][CO5]	**[6M]**
b)	Find inverse Laplace transform of $\frac{s^2+s-2}{s(s+3)(s-2)}$, using partial fractions.	[L1][CO5]	**[6M]**
9.**a)**	Find the Inverse Laplace transform of $\frac{1}{s\left(s^2+a^2\right)}$	[L1][CO5]	**[6M]**

b)	Find $L^{-1}\left\{s\log\left(\frac{s-1}{s+1}\right)\right\}$	[L1][CO5]	**[6M]**
10.a)	State Convolution Theorem.	[L1][CO5]	**[2M]**
b)	Using Convolution theorem, Find $L^{-1}\left\{\frac{1}{\left(s^2+5^2\right)^2}\right\}$	[L3][CO5]	**[5M]**
c)	Using Convolution theorem, Find $L^{-1}\left\{\frac{1}{(s+a)(s+b)}\right\}$	[L3][CO5]	**[5M]**

UNIT –V

APPLICATIONS OF LAPLACE TRANSFORMS&Z- TRANSFORMS

1.a)	Using Laplace Transform method to solve $y^1+y=1\,where\;y(0)=0$	[L3][CO6]	**[4M]**
b)	Apply Laplace transform method to solve $y^{11}+7y^1+10y=4e^{-3t}\quad where\quad y(0)=0\,,y^1(0)=-1$	[L6][CO6]	**[8M]**
2	Solve the D.E. $\frac{d^2x}{dt^2}+2\frac{dx}{dt}+x=3te^{-t}$ using Laplace Transform given that $x(0)=4;\frac{dx}{dt}=0.at,t=0$	[L3][CO6]	**[12M]**
3	a) Applying linearity property, find the Z –transforms of the following functions (i) an^2+bn+c (ii) $(n-1)^2$	[L3][CO6]	**[6M]**
	b) Determine the value of $Z\left[(-2)^n\right]$	[L5][CO6]	**[6M]**
4.a)	Define Z-Transforms	[L1][CO6]	**[2M]**
b)	Determine the value of $Z(\cos nt)\quad Z(\sin\,nt)\quad Hence\quad find\,(i)\,Z(n\cos nt)\,(ii)\,Z(n\sin\,nt)$	[L5][CO6]	**[10M]**
5.a)	State Damping rule.	[L1][CO6]	**[2M]**
b)	Find $Z\left\{\frac{1}{n(n+1)}\right\}$	[L1][CO6]	**[5M]**
c)	Find Z –transform of the following (i) e^{-an} (ii) ne^{-an} (iii) n^2e^{-an} (iv) na^n	[L1][CO6]	**[5M]**
6.a)	If f(z)=$\frac{5z^2+3z+12}{(z-1)^4}$,What are the values of f(2) and f(3)?	[L1][CO6]	**[6M]**
b)	Calculate the value of $Z\left\{\frac{1}{(n+2)(n+1)}\right\}$	[L3][CO6]	**[6M]**
7.a)	Find $Z^{-1}\left[\frac{z}{z^2+11z+24}\right]$	[L1][CO6]	**[6M]**
b)	Find the inverse Z –transform of $\frac{2z^2+3z}{(z+2)(z-4)}$	[L1][CO6]	**[6M]**

8.a)	State Convolution theorem.	[L1][CO6]	**[2M]**
b)	Calculate $Z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$, Using Convolution theorem.	[L3][CO6]	**[5M]**
c)	Compute the value of $Z^{-1}\left[\left(\frac{z}{z-a}\right)^2\right]$, Using Convolution theorem	[L3][CO6]	**[5M]**
9	Using the Z –transform, Solve $y_{n+2}+2y_{n+1}+y_n=n$. given that $y_0=y_1=0$	[L6][CO6]	**[12M]**
10	Solve the difference equation using Z –transform, $y_{n+2}-3y_{n+1}+2y_n=0 \quad \textit{given that } y_0=0, y_1=1$	[L3][CO6]	**[12M]**

Prepared by: Department of Mathematics