Sub Code: AHT301 **ROLL NO…………….……………..**

1st SEMESTER EXAMINATION, 2022 – 23
1st Year, M. Tech
CSE, Electrical Eng, Structural Eng, Structural Eng & Construction, Manufacturing Science & Eng, Power System Eng, Thermal Eng, Production Eng
Advanced Mathematics

Duration: 3:00 hrs **Max Marks: 100**

Note: - Attempt all questions. All Questions carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption made in the answer.

Q 1.	Answer any two parts of the following. a) Apply Gauss – Seidel iteration method to solve the equations $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. b) Apply Gauss – Jordan's method to solve the equations $x + 2y + z = 8$, $2x + 3y + 4z = 20$, $4x + 3y + 2z = 16$. c) Using Relaxation method solve the equations $10x - 2y - 3z = 205$, $-2x + 10y - 2z = 154$, $-2x - y + 10z = 120$.	10x2=20
Q 2.	Answer any two parts of the following. a) A rectangular plate with insulated surface is 8 cm wide and so long compared to its width that it may be considered infinite in length. If the temperature along one short edge $y = 0$ is given by $u(x,0) = 100\, sin\frac{\pi x}{8}$, $0 < x < 8$ while two long edges are kept at 0^0C. Find the steady state temperature. b) Solve non-linear partial differential equation $z(p^2 - q^2) = x - y$. c) (i) Eliminate arbitrary function f from the relation $f(x^2 + y^2, z - xy) = 0$. (ii) Form the partial differential equation from the relation $z = f_1(y + 2x) + f_2(y - 3x)$.	10x2= 20
Q 3.	Answer any two parts of the following. a) Solve the initial value problem $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = sint$, $y(0) = 0$ and $y'(0) = 0$ using Laplace transform. b) Find the Fourier transform of the Gauss function f defined for $a > 0$ by $f(t) = e^{-at^2}$. c) Making use of Fourier sine transform , solve the integral equation $\int_0^\infty f(t) sin\omega t dt = \begin{cases} 1 & for \quad 0 \le t \le 1 \\ 2 & for \quad 1 \le t, 2 \\ 0 & for\, t \ge 0 \end{cases}$	10x2= 20
Q 4.	Answer any two parts of the following. a) Find inverse Z –transform of $Z(z) = \frac{z^4+z^3-z^2-z+1}{z^2+2z+1}$. b) Using Z-transform to solve the difference equation $u_{n+2} - 2u_{n+1} + u_n = 2^n$ with the conditions $u_0 = 2$ and $u_1 = 1$. c) Find the $Z -$ transform of sinusoidal function $S(n) = \begin{cases} sin\omega nT & n \ge 0 \\ 0 & n < 0 \end{cases}$	10x2= 20

Q 5.	Answer any two parts of the following. a) (i) If X is uniformly distributed with mean 1 and variance $\frac{4}{3}$ find $P(X, 0)$. (ii) Determine first moment about origin for a Weibull distribution whose probability density function is given by $p(x) = c.x^{c-1}.\exp(-x^c)$. b) (i) Subway trains on a certain line run every half hour between midnight and six in the morning. What is the probability that a man entering the station at a random time during this period will have to wait at least twenty minutes? (ii) Show that for rectangular distribution $f(x) = \frac{1}{2a}, -a < x < a$, moment generating function about origin is $\frac{sinhat}{at}$. c) Find the moment generating function of the continuous normal distribution given by $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$, $-\infty < x < \infty$ and find its mean and variance.	10x2= 20

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