Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

FIRST SEMESTER B.TECH. (COMMON TO ALL BRANCHES)

END SEMESTER MAKE UP EXAMINATIONS, December, 2017

SUBJECT: ENGINEERING MATHEMATICS-I [MAT 1101]

REVISED CREDIT SYSTEM

19/12/2017

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data may be suitably assumed.

1A.	Find the largest eigen value and the corresponding eigen vector of the matrix $A=\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using power method. Take $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ as initial eigen vector. Carry out four iterations	4
1B.	Solve $(D^2-1)y=\frac{2}{(1+e^x)}$ by variation of parameters.	3
1C.	Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3 rule by taking ten intervals and hence obtain the value of π.	3
2A.	(i) Define the following : Orthogonal Basis and Orthonormal basis for E^n (ii) Prove that : The vectors $\vec{a}_1, \vec{a}_2, \cdots \vec{a}_n$ from E^n are linearly dependent if and only if one of the vectors is a linear combination of the others.	4
2B.	Using Euler's method, find an approximate value of y when $x=0.06$, given that $\frac{dy}{dx}=\frac{y-x}{y+x}$ and $y(0)=1$ with $h=0.02$	3

2C.	Solve $(y \log y)\, dx + (x - \log y)\, dy = 0$	3
3A.	Solve by Jacobi method. Carry out 4 iterations correct up to 4 decimal places $-2x_1 + 10x_2 - x_3 - x_4 = 15$ $10x_1 - 2x_2 - x_3 - x_4 = 3$ $-x_1 - x_2 + 10x_3 - 2x_4 = 27$ $-x_1 - x_2 - 2x_3 + 10x_4 = -9$	4
3B.	Solve $(D^2 - 4D + 4)\, y = e^{2x} + x^2$	3
3C.	The following data gives the velocity of a particle for 20 seconds at an interval of 5 seconds. Find the initial acceleration using the entire data : Time t(sec): 0, 5, 10, 15, 20 Velocity v(m/sec): 0, 3, 14, 69, 228	3
4A.	Determine f(x) as a polynomial in x using Newton divided difference formula for the following data : x: -4, -1, 0, 2, 5 f(x): 1245, 33, 5, 9, 1335	4
4B.	Using Gram-Schmidt orthogonalization process, construct an orthonormal set of basis vectors, from the following set of vectors (1,1,1), (0,1,1) and (0,0,1) for E^3.	3
4C.	Find the positive root of the equation $x^4 - x - 10 = 0$ correct to three decimal places, using Newton Raphson method with initial approximation $x_0 = 2$.	3
5A.	Find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ using elementary row transformations.	4
5B.	Apply Runge-Kutta method of fourth order to find approximate value of y for $x = 0.2$ if $y' = x + y$ given that $y = 1$ when $x = 0$ with step size $h = 0.1$.	3
5C.	Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2 \sin[\log(1+x)]$	3

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