Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **M.Sc.**
MMCC202

2nd Semester Back Examination 2017-18
NUMERICAL ANALYSIS
BRANCH : M.Sc.(MC), M.Sc.(MH)
Time : 3 Hours
Max Marks : 70
Q.CODE : C711

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions:** **(2 x 10)**

a) What is piecewise cubic Hermit Interpolation?

b) Calculate f'(5) using 3-point backward difference formula for following data points :

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

c) Estimate f'(1) using Richardson extrapolation for following given data points:

x	-1	0	1	2	3
y	0.25	0.5	1	2	4

d) Define explicit and implicit method in ODE. Give one example each.

e) Write the draw backs of Adams-Bash forth method?

f) Write the formula used in ABM2 Predictor-Corrector method?

g) Graph the piecewise linear interpolation for the data points(0,0),(1,1),(2,4) and (3,3).

h) Check the function $3u_{xx} + u_{xy} - 4u_{yy} + 3u_y = 0$ is parabolic, Hyperbolic or Elliptic?

i) Define basic functions in connection with the finite element method of elliptic partial differential equations.

j) State two methods for accelerating the convergence of QR method.

Q2 **a)** Assme f(x), f'(x) and f"(x) are continuous for all x in some neighbourhood of α and assume f(α) = 0, f'(α) ≠ 0. **(5)**

Then if x_0 is chosen sufficiently close to α, the iterates x_n ,n ≥ 0 of $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$ will converge to α.

b) Find the root of x^4-x-10=0 by using Muller's method. **(5)**

Q3 **a)** Find the cubic Hermite polynomial that satisfies p(1)=2,p'(1)=1,p(3)=1,p'(3)=2 **(5)**

b) Find the value of $f'(3)$ from the data points (91,20),(2,4),(3,8),(4,16) and (5,32) taking h=2 and using Richardson extrapolation. **(5)**

Q4 Solve the following differential equation by using 3rd order Adams-Bash forth Method: $y' = 1 + y^2, y(1) = 1, find\ y(1.6)$? **(10)**

Q5 **a)** Find the dominant eigen value of following matrix using power method **(5)**

$$\begin{bmatrix} 3 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 5 & 6 \end{bmatrix}$$

b) Using Q-R factorization ,solve the matrix $\begin{bmatrix} 45 & -44 & 22 \\ -44 & 44 & -22 \\ 22 & -22 & 10 \end{bmatrix}$ **(5)**

Q6 **a)** Find the eigen value of matrix A= $\begin{bmatrix} 20 & 9 & 1 \\ 8 & 8 & 6 \\ 4 & 5 & 6 \end{bmatrix}$ which is closest to b=10 **(5)**

b) Obtain the cubic spline approximation for the function defined by the data: **(5)**

x	0	1	2	3
f(x)	1	2	33	244

With M(0)=0, M(3)=0

Q7 **a)** Solve the following PDE using Bender-Schimidst recurrence relation: **(5)**
$2\frac{\partial u}{\partial t} = \frac{\partial^2(u)}{\partial x^2}$ using $u(x,0)= 4x-x^2$
$u(0,t)=0, u(4,t)=0, h=1, 0 \le x \le 4$ and for $t>0$

b) Approximate the following using Romberg Integration $\int_0^1 x \sin(\pi x)\, dx$ **(5)**

Q8 Solv the following parabolic PDE by using Crank-Nicolson formula $\frac{\partial u}{\partial t}=\frac{\partial^2(u)}{\partial x^2}$ **(10)**
,with initial condition as $u(x,0)=x^2$,for $0 \le x \le 4$ and boundary condition as $u(0,t)=u(4,t)=0$ for $0 \le x \le 4$, $0<t<4$,taking $\alpha = 1$