

Government College of Engineering, Aurangabad
(An Autonomous Institute of Government of Maharashtra)

M. E. (Production) Examination
End Semester Examination November / December 2016

ME 577: ADVANCED MATHEMATICAL METHODS

Time: Three Hours

30 NOV 2016

Max. Marks: 60

"Verify the course code and check whether you have got the correct question paper"

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Assume suitable data if necessary.
4. Use of non-programmable calculator is allowed.

Q 1) Using Crank-Nicolson's method, solve $\frac{\partial u}{\partial t} = \frac{1}{16} \frac{\partial^2 u}{\partial x^2}$, $0 < x < 1, t > 0$ given that $u(x, 0) = 0$, $u(0, t) = 0$, $u(1, t) = 50t$. Compute u for two steps in t direction taking $h=1/4$.
12 Marks

Q 2) Solve any ONE question

A) Find the inverse of the matrix

$$A = \begin{bmatrix} 3 & 2 & 1 \\ 2 & 3 & 2 \\ 1 & 2 & 2 \end{bmatrix}$$

12 Marks

using LU decomposition method.

B) Find the largest eigen value and the corresponding eigen vector of the matrix

$$A_1 = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix} \text{ using Power method.}$$

12 Marks

Q 3) Solve any ONE question

A) Perform three iterations of the Muller method to find the smallest positive root of the equation $f(x) = x^3 - 5x + 1 = 0$. Use the initial approximations $x_0 = 0.0$, $x_1 = 0.5$ and $x_2 = 1.0$.
12 Marks

B) Using Newton's iterative method, find the real root of $x \log_{10} x = 1.2$ correct to five decimal places.
12 Marks

Q 4) Fit the curve $pv^x = k$ to the following data

12 Marks

$p(\text{kg / cm}^2)$	0.5	1	1.5	2	2.5	3
$v(\text{litres})$	1620	1000	750	620	520	460

Q 5) Solve ALL questions

A) Solve $u_{n+2} - 6u_{n+1} + 9u_n = 0$

03 Marks

B) Solve $(E^2 - 4E + 3)y = 3^x$

03 Marks

C) Solve $y_{n+2} - 2\cos\alpha \cdot y_{n+1} + y_n = \cos\alpha n$.

06 Marks

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