# I B.Tech Examinations,June 2011 <br> MATHEMATICAL METHODS 

Common to ME, BME, IT, MECT, MEP, AME, ICE, E.COMP.E, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours
Max Marks: 80

## Answer any FIVE Questions

All Questions carry equal marks

1. Express the following quadratic form as 'sum of squares' by congruent transformation and write down the corresponding linear transformation $Q=10 x^{2}+y^{2}+z^{2}-6 x y-$ $2 y z+x z$.
2. (a) Find the rank of $\left(\begin{array}{ccccc}3 & 4 & 5 & 6 & 7 \\ 4 & 5 & 6 & 7 & 8 \\ 5 & 6 & 7 & 8 & 9 \\ 15 & 16 & 17 & 18 & 19\end{array}\right)$
(b) Find all the solutions of the following systems of linear homogeneous equations $x+y+z=0,2 x+5 y+7 z=0,2 x-5 y+3 z=0$.
3. (a) If $f(x)=\left\{\begin{array}{l}k x ; 0<x<\frac{\pi}{2} \\ k(\pi-x) ; \frac{\pi}{2}<x<\pi\end{array}\right.$

Find the half-range sine series.
(b) Find the Fourier expansion of $\mathrm{f}(\mathrm{x})=\mathrm{x} \cos \mathrm{x} ; 0<\mathrm{x}<2 \pi$.
4. (a) Solve z=px+qy $+p^{2} q^{2}$
(b) Using Convolution theorem, find the inverse-Z transform of $\frac{1}{\left(1-\frac{1}{2} z^{-1}\right)\left(1-\frac{1}{4} z^{-1}\right)}$.
5. Determine the characteristic roots and the corresponding characteristic vectors of the matrix $A=\left[\begin{array}{ccc}6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3\end{array}\right]$
6. (a) The table given below reveals the velocity v of a body during the specified time $t$. Find the acceleration at $\mathrm{t}=1.1$.

$$
\begin{array}{cccccc}
\text { t: } & 1.0 & 1.1 & 1.2 & 1.3 & 1.4 \\
\text { v: } & 43.1 & 47.7 & 52.1 & 56.4 & 60.8
\end{array}
$$

(b) Evaluate $\int_{0}^{1} \frac{d x}{1+x}$ by
i. Trapezoidal rule
ii. Simpson's one-third rule.
7. Find the value of $y(0.1)$ and $y(0.2)$ from $\frac{d^{2} y}{d x^{2}}-x \cdot\left(\frac{d y}{d x}\right)^{2}+y^{2}=0 ; y(0)=1, y^{\prime}(0)=0$ by using Taylor's series correct to 4 decimal places.
8. (a) Solve the following by iteration method: $\mathrm{x}^{3}+\mathrm{x}^{2}=100$
(b) Solve for a positive root by False position method: $\mathrm{e}^{-x}=\sin \mathrm{x}$.


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| :---: | :---: | :---: | :---: | :---: | :---: |
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