



I B.Tech I Sem Regular End Examination, July 2021

ENGINEERING MATHEMATICS - I**(EEE, CSE, INF, CSI & CSM)****Time: 3 Hours.****Max. Marks: 70**

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

- 1 a) Define normal form of a matrix 2M CO BL
 b) Find the values of k for which the system of equations 12M CO BL
 $(3k - 8)x + 3y + 3z = 0;$
 $3x + (3k - 8)y + 3z = 0;$
 $3x + 3y + (3k - 8)z = 0$ has a non-trivial solution.
- 2 a) Under what conditions Gauss-Seidal method is applicable. 2M CO BL
 b) Use Gauss-Jordan method to find the inverse of the matrix $\begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$. 12M CO BL
- 3 a) Diagonalize the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 2 & 2 & 4 \\ 4 & 1 & 3 \end{bmatrix}$. 7M CO BL
 b) For a matrix $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 3 & 2 \\ 0 & 0 & -2 \end{bmatrix}$ find the eigenvalues of $3A^3 + 5A^2 - 6A + 2I$. 7M CO BL
- 4 a) Expand $\log x$ in powers of $(x - 1)$ and hence evaluate $\log 1.1$ correct to four decimal places. 7M CO BL
 b) Prove that $\int_0^\infty \frac{x^8(1-x^6)}{(1+x)^{24}} dx = 0$ using $\beta - \Gamma$ functions 7M CO BL
- 5 a) Show that the two matrices A, A^T have the same latent roots. 7M CO BL
 b) Verify Rolle's theorem for the function $f(x) = x^{2m-1}(a-x)^{2n}$ in $(0, a)$. 7M CO BL
- 6 a) Verify Euler's theorem for the function $u = \frac{x^{1/2} + y^{1/2}}{x^n + y^n}$ 7M CO BL
 b) If $u = e^{a\theta} \cos(a \log r)$ then show that $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0$. 7M CO BL
- 7 a) Prove that the functions $\mathbf{u} = \mathbf{x} + \mathbf{y} + \mathbf{z}$, $\mathbf{v} = \mathbf{xy} + \mathbf{yz} + \mathbf{zx}$, $\mathbf{w} = x^2 + y^2 + z^2$ are dependent and find the relation between them. 7M CO BL
 b) Evaluate $\iiint xyz dx dy dz$ over the positive octant of the sphere $x^2 + y^2 + z^2 = a^2$. 7M CO BL
- 8 a) Change the order of integration and solve $\int_0^c \int_{x^2/a}^{2a-x} xy^2 dy dx$. 7M CO BL
 b) Find the area enclosed by the parabolas $x^2 = y$ and $y^2 = x$. 7M CO BL