3rd Sem ECE

M 26131

Reg. No. : ....

Name : ....

Third Semester B.Tech. Degree (Reg./Sup./Imp. – Including Part Time) Examination, November 2014
(2007 Admn. Onwards)
PT 2K6/2K6 CE/ME/EE/EC/AE1/CS/IT 301 : ENGINEERING MATHEMATICS – II

Time: 3 Hours Max. Marks : 100

PART – A

1. Using Taylor's theorem express $2x^3 - 7x^2 + x - 6$ in powers of $(x - 1)$.

2. Test the convergence of $1 + \frac{1}{2^2} + \frac{2^2}{3^3} + \frac{3^3}{4^4} + \ldots$

3. Find the non trivial solutions of $x_1 + 2x_2 - x_3 = 0$; $3x_1 + x_2 - x_3 = 0$; $2x_1 - x_2 = 0$.

4. Find the Eigen values of $\begin{bmatrix} 3 & -4 & 4 \\ 1 & -2 & 4 \\ 1 & -1 & 3 \end{bmatrix}$.

5. Find the circulation of $\bar{F} = y\bar{i} + z\bar{j} + x\bar{k}$ around the circle $x^2 + y^2 = 1$, $z = 0$.

6. Using divergence theorem show that $\iint_S \bar{r} \cdot \hat{n}\, ds = 3V$ where V is the volume enclosed by the surface S and $\bar{r}$ is the position vector of any point on the surface.

7. Define subspace of a vector space. Check whether $W = \{(a, b, c)/a + b + c = 0\}$ is a subspace of R^3.

8. Let $T : R^3 \to R^3$ defined by $T(x, y, z) = (2x, 4x - y, 2x + 3y - z)$. Show that T is invertible and find T^{-1}. **(8×5=40)**

P.T.O.

PART – B

9. If $y = \left(x + \sqrt{x^2 - 1}\right)^m$ show that $(x^2 - 1)y_{n+2} + x(2n+1)y_{n+1} + (n^2 - m^2)y_n = 0$.

OR

10. Test the convergence of $x + \frac{1}{2}\frac{x^3}{3} + \frac{1.3}{2.4}\frac{x^5}{5} + \frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}\frac{x^7}{7} + \ldots$

11. Verify that the Eigen values of A^2 and A^{-1} are respectively the squares and reciprocals of the Eigen values of A given that $A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$.

OR

12. Verify Cayley-Hamilton theorem and hence find A^{-1} if $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.

13. Verify Green's theorem for $\int_C (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$ where C is the boundary of the regress defined by the lines $x = 0$, $y = 0$, $x + y = 1$.

OR

14. Verify Stoke's theorem for $\bar{F} = y\bar{i} + (x - 2xz)\bar{j} - xy\bar{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ above the XY plane.

15. Prove that an orthogonal set of nonzero vectors in a vector space is linearly independent. Is the converse true (give example).

OR

16. a) Define linearly independent and dependent vectors. Show that the vector $X_1 = (1, 2, -1, 3)$, $X_2 = (2, -1, 3, 2)$ and $X_3 = (-1, 8, -9, 5)$ form a linearly dependent system. Find the linear relation connecting them.

    b) Find the subspace of R^3 spanned by (1, 1, 1), (2, 1, 0) and (1, 1, –1). **(15×4=60)**