

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2015

B. Tech.(All Branches), Semester II

Roll No.....

COURSE CODE: ENGG 202

Time: 3 hours

Max. Marks: 100

COURSE TITLE: Engineering Mathematics 2

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Calculators are allowed.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

10

- i. The rank of matrix $A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$
- (a) 1 (b) 2 (c) 3 (d) none of these
- ii. The dimension of the vector space $W = \{(a, a, a, t) : a, t \in \mathbb{R}\}$ is
- (a) 1 (b) 2 (c) 3 (d) 4
- iii. The vectors $(1, 0, 1)$, $(0, 1, 2)$ and $(1, 0, -1)$ are
- (a) Linearly dependent (b) Linearly independent
(c) both (d) none of these
- iv. The PDE $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial y^2}$ is
- (a) Elliptic (b) Parabolic
(c) Hyperbolic (d) none of these
- v. If $0.X = B$ and $B \neq 0$, then X will have solution.
- vi. If a vector space V is defined by $V = \{(x, y, z) : x, y, z \in \mathbb{R}\}$, then the dimension of vector space V is
- (a) 1 (b) 2 (c) 3 (d) none of these
- vii. State True/False: $\lim_{n \rightarrow \infty} \left(\frac{n^2 - 2n}{3n^2 + n} \right)$ is convergent.
- viii. In electromagnetic theory, if $\vec{\nabla} \times \vec{F} = 0$, the vector field $\vec{F}$ is said to be.....
- ix. State True/False: vectors $\langle 1, 1, 1 \rangle$, $\langle 0, 2, 3 \rangle$ and $\langle 1, 5, 8 \rangle$ forms a basis for $V = \mathbb{R}^3$.
- x. Write the trace of matrix $A = \begin{bmatrix} -1 & 0 & 1 \\ 0 & 0 & 2 \\ 0 & 1 & 1 \end{bmatrix}$.

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

- (i) Define Stoke's theorem with example.
- (ii) State the values of x for which the series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \dots$ converge.



- (iii) Define a Linear Mapping. Show whether the mapping $G: R^3 \rightarrow R^3$ defined by $G(x, y, z) = (x, y, z + 2)$ is a linear map or not.
- (iv) Explain elliptic PDE, give one example.
- Q.3A Find the eigenvalues and eigenvectors of the matrix $\begin{bmatrix} 8 & 2 \\ -4 & 2 \end{bmatrix}$ and hence find the matrix P that diagonalizes the given matrix. 05
- Q.3B Define Spanning set and Subspaces. Show that the vectors $(1, 2, 0)$, $(-1, 1, 2)$ and $(3, 0, -4)$ spans R^3 . 05
- Q.4A Find the complete integral of $p^2 x^2 = z(z - qy)$. 05
- Q.4B Find the solution of $(D^2 + 4D + 4)y = x^2 e^{-x}$ 05
- Q.5A Find two series solutions of the differential equation $y'' - xy = 0$ about the ordinary point $x = 0$ by Frobenius method. 05
- Q.5B Define Linear combination and Linearly dependent and independent vectors. Consider a vector space $V = R^3$. Check whether the vectors $\langle 1, 0, 1 \rangle$, $\langle 0, 1, 1 \rangle$ and $\langle 1, 1, 0 \rangle$ forms a basis for V or not. If possible, express the vector $\langle 1, -1, 3 \rangle$ as a linear combination of above mentioned vectors. 05
- Q.6A Define Vector spaces. Consider the set V of positive real numbers. If x and y denote positive real numbers, then we write vectors in V as $x = x$ and $y = y$. Now, addition of vectors is defined by: $x + y = xy$ and scalar multiplication is defined by $kx = xk$. Determine whether V is a vector space. 05
- Q.6B Solve $(D^2 + 2D + 5)y = x^e + e^x + e^e + \sin 2a$ 05
- OR
- Q.6B Solve the following PDE using Lagrange's multiplier method 05
 $yzp - xzq = xy$
- Q.7 Given the system of linear simultaneous equations: $x + y + z = 11$, $2x - 6y - z = 0$, $3x + 4y + 2z = 0$. Find whether the given system is consistent. If yes, find the solution and if no, specify the reason. 10
- OR
- Q.7 Find the Fourier series of $f(x) = \begin{cases} 0, & -2 < x < 0 \\ -x, & 0 \leq x < 2 \end{cases}$. 10
- Q.8 Find the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$. 10
- Q.9A Find an equation of the tangent plane to the graph of $x^2 + y^2 + z^2 = 9$ at $(-2, 2, 1)$. 10
- Q.9B Solve the ODE $(D^2 + 1)y = \sec x$. 10
- OR
- Q.9B Use Green's theorem to evaluate the line integral $\oint_C (x^4 - 2y^3)dx + (2x^2 - y^4)dy$, where C is the circle $x^2 + y^2 = 4$. 10