

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: MA 201

Time: 3 hours

Max. Marks: 100

COURSE TITLE: Engineering Mathematics II

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 $A = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix}$
(a) 1 (b) 2 (c) 3 (d) none of these
- ii. The dimension of the vector space $W = \{(a, b, b, t) : a, b, t \in \mathbb{R}\}$ is
(a) 1 (b) 2 (c) 3 (d) 4
- iii. The vectors $(1, 1, 1)$, $(-1, 1, 2)$ 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 $0 \cdot X = B$ 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. What is the C.F. of $(D^2 + a^2)^2 y = x \sin x e^{x^2}$.
- viii. Write the solution of $p^3 - q^3 = 0$.
- ix. Write the trace of matrix $A = \begin{bmatrix} -1 & 0 & 1 \\ 0 & 0 & 2 \\ 0 & 1 & 1 \end{bmatrix}$.
- x. State True/False : A triangle is an example of convex set.

Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- (i) Solve the ODE $(y^2 - x^2)dx + 2xy dy = 0$.
- (ii) Solve : $xq + yp + pq = 0$, where p and q have their usual meanings.



(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)	Solve the following PDE using Lagrange's multiplier method $xp - yq = 3z$.	
Q.3A	Solve the following differential equations (i) $y(xy + y^2x^2)dx + x(xy - y^2x^2)dy = 0$ (ii) $y' + x \sin 2y = x^3 \cos^2 y$	05
Q.3B	An aeroplane of an airline can carry a maximum of 200 passengers. A profit of Rs 400 is made on each first-class ticket and a profit of Rs 300 is made on each economy class ticket. The airline reserves at least 20 seats for first class. However at least 4 times as many passengers prefer to travel by economy class than by first class. Give the mathematical formulation of the problem. Show the feasible region on graph.	05
Q.4A	Solve $(D^2 + 2D + 5)y = x^e + e^x + e^e + \sin 2a$.	05
Q.4B	Find the complete solution of the second order ODE $(D^2 + 4D + 3)y = e^{-x} \sin x + x$.	05
Q.5A	Find the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.	05
Q.5B	Define vector spaces and sub space. 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 these vectors.	05
Q.6A	Solve the following Cauchy-Euler differential equation $(x^2D^2 - 3xD + 5)y = x^2 \sin(\ln x)$.	05
Q.6B	Solve the following differential equation by method of variation of parameters $(D^2 + 2D + 1)y = e^{-x} \ln x$.	05
	OR	
Q.6B	Solve the ODE $(D^2 + a^2)y = \operatorname{cosec} ax$.	05
Q.7A	Solve the following system of linear equations using any matrix method. $x + y + z = 11$, $2x - 6y - z = 0$, $3x + 4y + 2z = 0$.	05
Q.7B	Solve the following PDE using Charpit's method $qz - p^2y - q^2y = 0$.	05
	OR	
Q.7B	Solve the following LPP by graphical method Minimize $Z = x - 5y + 20$ subject to $x - y \geq 0$; $-x + 2y \geq 2$; $x \geq 3$; $y \leq 4$	05

8A	Solve the following ODE using power series method about $x=0$. $xy'' + y' + 2y = 0$	10
Q.9A	Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$. Hence find A^{-1} .	10
Q.9B	Solve the following LPP by Simplex method Maximize $Z = 10x + 6y$ subject to $3x + y \leq 12$ $2x + 5y \leq 34$ and $x \geq 0, y \geq 0$	10
Q.9B	OR Solve the Laplace's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, in rectangle $u(x, 0) = f(x)$, $u(x, b) = 0$ $U(0, y) = 0$, $u(a, y) = 0$.	10

