Reg. No.



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



III SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: ENGINEERING MATHEMATICS [MAT 2104]

REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ALL the questions.
- Missing data may be suitable assumed.

1A.	Find a Fourier series expansion for $f(x) = \begin{cases} x & \text{if } \frac{-\pi}{2} < x < \frac{\pi}{2} \\ \pi - x & \text{if } \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$.	4
1B.	Solve using the transforms $v = x, z = x - y$, the equation $u_{xx} + 2u_{xy} + u_{yy} = 0$.	3
1C.	State axioms of probability. If A and B are any two events, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.	3
2A.	Verify Green's theorem in the plane for $\int_{C} (xy + y^2) dx + x^2 dy$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.	4
2B.	Solve the partial differential equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ by the method of separation of variables subject to $u(x,0) = 6e^{-3x}$, $\forall x$.	3
2C.	Find the Fourier transform of $f(x) = e^{\frac{-x^2}{2}}$	
3A.	Prove that $\vec{A} = (6xy + z^3)i + (3x^2 - z)j + (3xz^2 - y)k$ is irrotational. Find ϕ such that $\vec{A} = \nabla \phi$.	4

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3B.	Define mutually exclusive events and independent events. If A and B are independent events with P (A) = $1/3$ and P (B) = $1/4$, then find P(A ^c \cup B ^c).	3
3C.	Find the half range cosine series for the function $f(x) = x$, $-1 < x < 1$	3
4A.	Suppose that joint pdf of the two dimensional random variable (X, Y) is given by $f(x,y) = \begin{cases} x^2 + \frac{xy}{3}, & 0 \le x \le 1, \ 0 \le y \le 2 \\ 0, & \text{elsewhere} \end{cases}$ Compute (i) P(X \ge Y), (ii) E(X)	4
4B.	Show that $P[(A \cap \overline{B}) \cup (B \cap \overline{A})] = P(A) + P(B) - 2P(A \cap B)$	3
4C.	Obtain the Fourier series of expansion for the function $f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2-x, & 1 \le x \le 2 \end{cases}$	3
5A.	Let $F = 4xzi-y^2j+yzk$ evaluate $\iint_{s} F \cdot nds$ where S is the surface of the cube bounded by x =0, x =1, y =0, y =1, z =0, z =1.	4
5B.	Three machines A, B and C produce respectively 60%, 30% and 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively2%, 3% and 4%. An item is selected at random and is found to be defective. Find the probability that the item was produced by machine A.	3
5C.	Derive one dimensional wave equation.	3