



# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



## **III SEMESTER B.TECH (CIVIL ENGINEERING)**

## END SEMESTER MAKE UP EXAMINATIONS, DEC/JAN 2015-16

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.

1 <b>A</b> .	Find a Fourier series to represent $f(x) = 2x - x^2$ in (0, 3).	4
1B.	Solve using the transforms $v = x$ , $z = x + y$ , the equation $u_{xy} - u_{yy} = 0$ .	3
1C.	State and prove Bayes' theorem.	3
2A.	State Green's theorem and apply the same to evaluate $\oint_C (2x^2 - y^2)dx + (x^2 + y^2)dy$ , where the curve C is boundary of the area enclosed by the x-axis and the upper half of the circle $x^2 + y^2 = a^2$ .	4
2B.	Solve the partial differential equation $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 2(x + y)u$ by the method of separation of variables.	3
2C.	Find the Fourier transform of the function $f(x) = \begin{cases} 1 & \text{if }  x  < 1 \\ 0 & \text{if }  x  \ge 1 \end{cases}$	3
3A.	Prove $\mathbf{F} = (y^2 \cos x + z^3) \mathbf{i} + (2y \sin x - 4) \mathbf{j} + (3xz^2 + 2)\mathbf{k}$ is a conservative force field. Find the scalar potential for <b>F</b> .	4

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प्रज्ञानं ब्रह्म Manipal SPIRED BY	Manipal Institute of Technology, Manipal (A Constituent Institute of Manipal University)	ALLEDGE IS POWE
	Suppose A, B and C are events such that	
3B.	$P(A) = P(B) = P(C) = \frac{1}{4}, \ P(A \cap B) = P(C \cap B) = 0 \ and \ P(A \cap C) = \frac{1}{8}.$	3
3C.	Evaluate the probability that at least one of the events A, B or C occurs. Find the half range cosine series for the function $f(x) = x$ , $0 < x < 2$	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 + Y \ge 1) (ii) P(Y > X)	4
4B.	If $A \subseteq B$ ; then $P(A) \leq P(B)$ .	3
4C.	Find a Fourier series expansion for $f(x) = \begin{cases} \pi x & \text{if } 0 \le x \le 1 \\ \pi(2-x) & \text{if } 1 \le x \le 2 \end{cases}$	3
5A.	Evaluate the surface integral $\iint_{s} A.nds$ , where A = 18zi - 12j + 3yk and S is that part of plane 2x + 3y + 6z = 12, which is located in the first octant.	4
5B.	A lot consists of 10 good articles, 4 with minor defects, 2 with major defects. One article is chosen at random. Find the probability that (a) it has no defects; (b) it has no major defects; (c) it is either good or has major defects.	3
5C.	Derive one dimensional heat equation.	3