Reg.No									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL UNIVERSITY, MANIPAL - 576 104

IV SEMESTER BTech DEGREE END SEMESTER MAKE UP EXAMINATION–MAY 2016

SUB: ENGG.MATHEMATICS – IV (MAT – 2211)

Duration: 3 Hrs. **Max. Marks: 50**

✍ **Note: a) Answer all FIVE full questions. b) All questions carry 10 (4 + 3 + 3) marks.**
✍ **c) Statistical tables may be used. d) Missing data may be suitably assumed.**

1A. Prove that

i. $\int J_3(x)dx = c - J_2(x) - \frac{2}{x}J_1(x)$

ii. $\frac{d}{dx}\{xJ_nJ_{n+1}\} = x[{J_n}^2 - {J_{n+1}}^2]$

1B. State and prove theorem on total probabilities and hence deduce Baye's theorem.

1C From 6 positive and 8 negative numbers, 4 numbers are chosen at random (without Replacement) and multiplied. What is the probability that the product is positive.

2A. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre's polynomial.

2B. Let $\bar{X}$ be a mean of a random sample space of size 'n' from a distribution which has $N(\mu, 9)$. Find 'n' such that $P(\bar{X} - 1 < \mu < \bar{X} + 1) = 0.9$

2C Prove that Poisson distribution is a limiting case of Binomial distribution.

3A. Obtain the series solution of $9x(1-x)y'' - 12y' + 4y = 0$

3B. Suppose that a 2 dimensional random variable (X, Y) has joint pdf given by

$$f(x,y) = \begin{cases} kx(x-y) & 0 < x < 2,\ -x < y < x \\ 0 & else \end{cases}$$

i. Evaluate 'k'

ii. Compute the marginal pdf of X and Y

3C. Compute approximately the probability that the mean of the random sample space of size 15 from a distribution having pdf $f(x) = \begin{cases} 3x^2 & 0 < x < 1 \\ 0 & elsewhere \end{cases}$ is between $\frac{3}{5}$ and $\frac{4}{5}$

4A. If X has P(λ) distribution . Find the moment generating function. Also find $E(X)$ and $V(X)$

4B. Solve the difference equation $y_{n+2} - 4y_n = n^2 + n - 1$

4C. Fit a second degree parabola for the following data

x	1	2	3	4	5	6	7
y	80	90	92	83	94	99	92

5A. Find the inverse z-transform of the following

i. $\frac{2z^2+3z}{(z+2)(z-4)}$

ii. $\frac{z^2+z}{(z-1)(z^2+1)}$

5B. A two dimensional random variable (X, Y) is uniformly distributed in the region bounded by a circle $x^2 + y^2 = 1$. Find $Cov(X, Y)$

5C. (i) If a random variable X has a uniform distribution over $(-\frac{\pi}{2}, \frac{\pi}{2})$, then find the pdf of $Y = tanX$

(ii) If $X \sim N(1, 4)$, then find $P(|X| > 4)$