

G 500

**B.TECH. DEGREE EXAMINATION, MAY 2014**

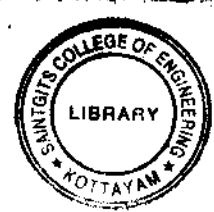
**Fourth Semester**

**EN 010 401—ENGINEERING MATHEMATICS—III**

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

(Common to all Branches)



Maximum : 100 Marks

Time : Three Hours

**Part A**

Answer all questions.  
Each question carries 3 marks.

1. If  $f(x) = \begin{cases} kx, & 0 \leq x \leq \frac{l}{2} \\ k(l-x), & \frac{l}{2} \leq x \leq l \end{cases}$

find  $a_0$ .

2. Show that the Fourier Cosine transform of Fourier Cosine transform of a given function is itself.

3. Solve :  $a(p+q) = z$ .

4. Find the distribution function from  $f(x) = \begin{cases} c(3+2x), & 0 < x < 2 \\ 0, & \text{otherwise} \end{cases}$

5. What are type-I and type-II errors ?

(5 × 3 = 15 marks)

**Part B**

Answer all questions.  
Each question carries 5 marks.

6. Write the Fourier Series for  $f(x) = \begin{cases} 1-x, & -\pi < x < 0 \\ 1+x, & 0 < x < \pi \end{cases}$

7. Find the finite Fourier Cosine transform of  $f(x) = \frac{\pi}{3} - x + \frac{x^2}{2\pi}$ .

Turn over

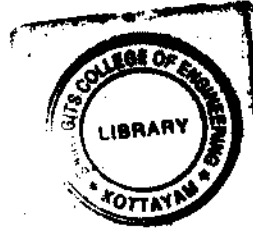
8. Solve :  $\left(\frac{y^2 z}{x}\right) p + xzq = y^2$ .

9. Fit a binomial distribution for :

$x$	:	0	1	2	3	4
$f$	:	5	29	36	25	5

10. Write the application of  $\psi^2$ -test.

(5 × 5 = 25 marks)



### Part C

Answer all questions.

Each question carries 12 marks.

11. Obtain the Fourier Series for  $f(x) = \begin{cases} l-x, & 0 < x \leq l \\ 0, & l \leq x < 2l \end{cases}$

Hence deduce that  $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = \frac{\pi}{4}$  and  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$ .

(12 marks)

Or

12. If  $f(x) = lx - x^2$  in  $(0, l)$ , show that the half range, sine series for  $f(x)$  is

$$\frac{8l^2}{\pi^3} \sum_{n=0}^{\infty} \frac{1}{(2n+1)^3} \sin \frac{(2n+1)\pi x}{l} \dots \text{ and deduce that } \frac{\pi^3}{3^2} = 1 - \frac{1}{3^3} + \frac{1}{5^3} - \dots$$

(12 marks)

13. Show that the Fourier transform of  $f(x) = \begin{cases} a^2 - x^2 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a > 0 \end{cases}$

is  $2 \sqrt{\frac{2}{\pi}} \left( \frac{\sin as - as \cos as}{s^3} \right)$ . Hence deduce that  $\int_0^{\infty} \frac{\sin t - t \cos t}{t^3} dt = \frac{\pi}{4}$ .

(12 marks)

Or

14. (i) Find the finite sine transform of  $f(x) = x^3$ .

(6 marks)

(ii) Find the cosine transform of  $f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x > a \end{cases}$

(6 marks)

15. (a) Solve :  $r - 2s + t = \sin(2x + 3y)$ .

(6 marks)

(b) Solve :  $(D^2 + D'^2)z = \cos mx \cos ny$ .

(6 marks)

Or

16. (a) Solve :  $D(D + D' - 1)(D + 3D' - 2)z = x^2 - 4xy + 2y^2$ .

(9 marks)

(b) Solve :  $r - s + p = 1$ .

(3 marks)

17. (a) If 15% of a normal population lies below the value 30 and 10% of the population lies above the value 42, calculate its Mean and Standard Deviation.

(6 marks)

(b) Fit a Poisson Distribution to :

$x$	:	0	1	2	3	4
$f$	:	43	38	22	9	1

(6 marks)

Or

18. (a) Six coins are tossed once. Find the probability of obtaining heads.

(i) exactly 3 times.

(ii) atmost 3 times.

(iii) atleast 3 times.

(iv) atleast once.

(8 marks)

(b) Given :  $X$  is a Poisson variate with  $P(X=2) = \frac{2}{3}P(X=1)$ . Find  $P(X=0)$  and  $P(X \geq 2)$ .

(4 marks)

19. (a) Test for the difference of variances for :

Method 1 : 20 16 27 26 22 23

Method 2 : 27 33 42 32 35 34 38

(6 marks)

(b) The 9 items of a sample have 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these values differ significantly from the assumed mean 47.5 ?

(6 marks)

Or

Turn over

20. (a) Given :

Day	: Mon	Tue	Wed	Thu	Fri	Sat	Sun
<i>f</i>	: 16	8	12	11	6	14	14
(No. of accidents)							

Is there any reason to doubt that the accident is equally likely to occur on any day of the week? (6 marks)

(b) A machine produced 20 defective units in a sample of 400. After overhauling the machine, it produced 10 defective units in a hatch of 300. Has the machine improved due to overhauling? (6 marks)

[5 × 12 = 60 marks]

