

**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)

Time : Three Hours

Maximum : 100 Marks

**Part A***Answer all questions.  
Each question carries 3 marks.*

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

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  $f(x) = \begin{cases} c(3+2x) & , \quad 0 < x < 2 \\ 0 & , \quad \text{otherwise} \end{cases}$ 

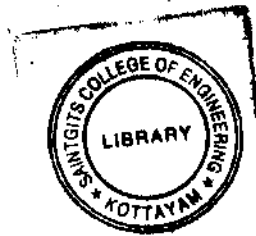
5. What are type-I and type-II errors ?

(5 × 3 = 15 marks)

**Part B***Answer all questions.  
Each question carries 5 marks.*6. Write the Fourier Series for  $f(x) = \begin{cases} 1-x & , \quad -\pi < x < 0 \\ 1+x & , \quad 0 < x < \pi \end{cases}$ 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  $\chi^2$ -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  $2 \cdot \sqrt{\frac{2}{\pi}} \left( \frac{\sin as - as \cos as}{s^3} \right)$ . 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
$f$	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]

