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

   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 ψ^2 -test.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each question carries 12 *marks.*

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

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

(12 marks)

Or

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

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

(12 marks)

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

is $2.\sqrt{\frac{2}{\pi}} \left(\frac{\sin as - as \cos as}{s^3}\right)$. Hence deduce that $\int_0^{\infty} \frac{\sin t - t \cos t}{t^3} dt = \pi/4$. (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 : $\left(D^2 + D^{1^2}\right)z = \cos mx \cos ny$. (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 (No. of accidents)	:	16	8	12	11	6	14	14

Is there any reason to doubt that the accident is equally likely to occur on any day of the weak ?

(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]