B.E. Third Semester (Biomedical Engineering) (CGS)

10098 : Transforms and Probability : Paper 3 BM 01

P. Pages : 3 | AU - 2558

Time : Three Hours | Max. Marks : 80

Notes : 1. All question carry equal marks.
2. Answer **three** question from Section A and **three** question from Section B.
3. Due credit will be given to neatness and adequate dimensions.
4. Illustrate your answer necessary with the help of neat sketches.

SECTION - A

1. a) Find the half range series with periods to represent: 7

$f(x) = 2x - x^2, (0, 3)$.

b) Find the Fourier half range sine series to represent the function: 7

$f(x) = mx, 0 \le x \le \pi/2$

$= m(\pi - x), \pi/2 \le x \le \pi$

OR

2. a) Find the Fourier series to represent cos ax in the interval $0 < x < 2\pi$ and a is non-integer. 7

b) Prove that for $0 < x < \pi$. 7

$$x(\pi - x) = \frac{\pi^2}{6} - \left[\frac{\cos 2x}{1^2} + \frac{\cos 4x}{2^2} + \frac{\cos 6x}{3^2} + ...\right]$$ & hence prove that $\sum_{n=1}^{\infty} \frac{1}{x^4} = \frac{\pi^4}{90}$

3. a) Solve the integral equation. 7

$$\int_0^{\infty} f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha, & 0 \le \alpha \le 1 \\ 0, & \alpha > 1 \end{cases}$$

b) The initial temperature along the length of bar is given by: 6

$$u(x,0) = \begin{cases} 2, & |x| \le 1 \\ 0, & |x| > 1 \end{cases}$$

If the temperature u (x, t) satisfies the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $-\infty < x < \infty$, $t > 0$ find the temperature at point of the bar at any time t.

OR

4. a) Using Fourier integral representation show that, 6

$$\int_0^{\infty} \frac{\omega \sin x\omega}{1+\omega^2} d\omega = \frac{\pi}{2} e^{-x}, x > 0.$$

b) Using Fourier integral representation show that: 7

$$\int_0^{\infty} \frac{\cos wx}{k^2+w^2} dw = \frac{\pi e^{-kx}}{2k},\ x > 0,\ k > 0$$

5. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$. 6

b) Evaluate $\oint_C \frac{e^z}{z^2+1} dz$, $C : |z| = 2$. 6

OR

6. a) Evaluate by Cauchys integral formula. 6

$$\oint \frac{\sin^2 z}{(2-\pi/6)^3} dz, \text{ where C is } |z| = 1$$

b) Show that $u = \frac{1}{2} \log\left(x^2 + y^2\right)$ is harmonic construct f(z). 7

SECTION - B

7. a) Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that both cards belong to 6
   i) A specified suit
   ii) The same suit

b) Calculate standard deviation for the following data: 7

x:	5–10	10–15	15–20	20–25	25–30	30–35	35–40
f:	6	8	17	21	15	11	2

OR

8. a) What is the probability that leap year selected at random will contain 53 Sundays? 6

b) From the group of 4 men, 3 women & 5 children. 4 persons are selected at random Find the probability that the group selected consists of no man. 7

9. a) A function is defined as follows: 7

$$f(x) = \theta,\ x < 2$$
$$= \frac{1}{18}(2x+3),\ 2 \le x \le 4$$
$$= 0,\ x > 4$$

show that it is a density function.

b) Two marbles are drawn at random from a bag containing 3 white and 2 yellow marbles. If the random variable X denotes the number of yellow marbles drawn, obtain the probability distribution of X. 7

OR

10. a) Find the co-efficient of correlation between x & y for the following data: 7

x	75	30	60	80	53	35	15	40	38	48
y	85	45	54	91	58	63	35	43	45	44

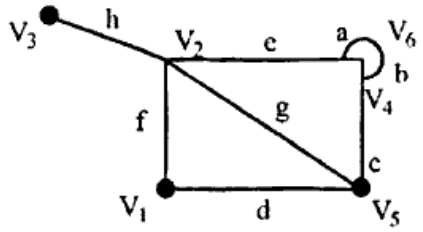
b) A box contains 5 white and 3 red balls. If two balls are drawn at random, without replacement, find the probability that; 7
   a) The first is white & second is red
   b) The second is red.

11. a) A connected graph G is Euler graph iff each vertex of G is even vertex. 6

b) In a tree there are atleast two pandant vectors. 7

OR

12. a) Use cutset matrix to represent the graph. 7



b) Every tree has either one or two centres. 6

****