B.Tech. (Computer Technology / Computer Engineering / Information Technology)
Third Semester (C.B.C.S.)

Applied Mathematics-III

P. Pages : 2
Time : Three Hours

PSM/KW/23/2575/2581/2587
Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Use of non programmable calculator is permitted.

1. a) If $L\{tf(t)\} = -\frac{d}{ds}\bar{f}(s)$, then find $L\{t\cos 2t\}$. **4**

b) Find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$ by convolution theorem. **5**

c) Find the Fourier sine transform of $e^{-|x|}$ and hence show that **5**

$$\int_0^\infty \frac{x\sin mx}{1+x^2}\,dx = \frac{\pi}{2}e^{-m}, m>0$$

OR

2. a) $\frac{d^2y}{dt^2}+2\frac{dy}{dt}+5y = e^{-t}\sin t, y(0)=0$ and $y'(0)=1$, using Laplace transform. **7**

b) Express $f(x) = \begin{cases}1, |x|<1\\ 0, |x|>1\end{cases}$, as Fourier integral and hence evaluate $\int_0^\infty \frac{\sin\lambda}{\lambda}\,d\lambda$. **7**

3. a) Find z - transform of $\frac{1}{n+1}$. **7**

b) Find inverse z - transform of $\frac{z^2+z}{(z-1)(z^2+1)}$ by partial fraction method. **7**

OR

4. a) Solve $y_{n+2}+3y_{n+1}+2y_n = u_n$, given that $y_0 = 1, y_n = 0$ for $n<0$. **7**

b) Find inverse z – transform of $\frac{z^3}{(z-2)^3}, |z|>2$. **7**

5. a) Investigate the linear dependence of the vectors **7**

$X_1 = (1,2,4)$, $X_2 = (2,-1,3)$

$X_3 = (0,1,2)$, $X_4 = (-3,7,2)$

and if possible find the relation between them.

b) Use Sylvester's theorem to show that $\sin^2 A + \cos^2 A = I$, where $A = \begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$. 7

OR

6. a) Find the singular values decomposition of the matrix $A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$. 7

b) Find largest eigen value and corresponding eigen vector for the matrix $A = \begin{bmatrix} -4 & -5 \\ 1 & 2 \end{bmatrix}$. 7

7. a) Let X be the random variable having density function 7

$$f(x) = \begin{cases} e^{-x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

Find (i) E (X) (ii) Var (X) (iii) σ_X

b) An insurance salesman sells policies to 5 men all of identical age and in good health. The probability that a man of this particular age will be alive 30 yrs. is 2/3. Find the probability that in 30 yrs, (i) all 5 man, (ii) at least 3 man (iii) only 2 man (iv) at least 1 man (v) at most 1 man will be alive. 7

OR

8. a) A random variable X has density function given by, 7

$$f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0 \quad , & x < 0 \end{cases}$$

Find the moment generating function and also first four moment about the origin.

b) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001, determines the probability that out of 2,000 individuals
a) exactly 3 b) more than 2 c) at least 4 will suffer a bad reaction. 7

9. a) Find multiple linear regression equation of X_1, X_2 and X_3 from the data relating to three variables given below: 7

X_1	4	6	7	9	13	15
X_2	15	12	8	6	4	3
X_3	30	24	20	14	10	4

b) Calculate mode for the following frequency distribution. 7

Size	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
Frequency	9	12	15	16	17	15	10	13

OR

10. a) The following are the marks of 150 students in an examination. 7

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of Students	10	40	20	0	10	40	16	14

Calculate Karl Person's coefficient of Skewness.

b) Find the measure of Skewness on the basis of moments. 7

x	2	3	4	5	6
f	1	3	7	3	1

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