SAMPLE QUESTIONS SET

Subject: Applied Mathematics IV

Course: CBCGS/CBGS

SE: ELEX/E&TC Branch

Q.1 The angle between the vectors u = (6, 2, 2) and v = (3, 0, -9) are

a) 0 b) $\pi/2$ c) π d) 1/2

Q. 2. The inner product of u = (-2, 4, 0, -3) and v = (3, 4, 6, -4) are

a) 20 b) 22 c) ?? d) 4

Q 3. If $\|u+v\|$=6 and $\|u-v\|$=4, u .v is

a) 0 b) 2 c) ? d) 5

Q. 4. The projection of u = (1, -2, 3) along v = (1, 2, 1) in R3 is

a) 0 b) 6 c) ?? d) 8

Q.5 The residue of F(z) = $\frac{1+z}{z^2-2z^4}$ at a pole of order 2 is

(a) 1 (b) - 1 (c) 2 (d) None of these

Q.6 The singular points of F(z) = $\frac{1}{z(z-1)^2}$ are

0 , 1, -1 (b) 0 , 1, 1 (c) 1, -1 (d) None of these

Q,7 The sum of residues of F(z) = $\frac{z^2}{(z+2)(z-1)^2}$ are

0 (b) 1 (c) -1 (d) None of these

Q.8 The simple poles of f(z) = $\frac{z^2-4}{(z^2+5z+4)}$ are

a) 1,4 b) -1,4 c) -1,- 4 d) None of these.

Q.9. The eigen values of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ are

$(a)\quad 0,0,0 \quad (b)\quad 0,0,1 \quad (c)\quad 0,0,3 \quad (d)\quad 1,1,1$

Q.10. The minimum and maximum eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ are -2 and 6 respectively. What is the other eigen value?

$(a)\quad 5 \quad (b)\quad 3 \quad (c)\quad 1 \quad (d)\quad -1$

Q.11. Which of the following matrices is not diagonalizable?

$(a)\ \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix} \quad (b)\begin{bmatrix} 1 & 0 \\ 3 & 2 \end{bmatrix} \quad (c)\ \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \quad (d)\ \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

Q.12. The sum of eigen values of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ is

$(a)\quad 5 \quad (b)\quad 7 \quad (c)\quad 9 \quad (d)\quad 18$

Q.13. The minimal polynomial associated with the matrix $\begin{bmatrix} 0 & 0 & 3 \\ 1 & 0 & 2 \\ 0 & 1 & 1 \end{bmatrix}$ is

$(a)\ x^3-x^2-2x-3 \quad (b)\quad x^3-x^2+2x-3 \quad (c)\ x^3-x^2-3x-3 \quad (d)\quad x^3-x^2+3x-3$

Q.14. Eigen values of a matrix $S = \begin{bmatrix} 3 & 2 \\ 2 & 3 \end{bmatrix}$ are 5 and 1. What are the eigen values of the matrix S^2 ?

(a) 2 and 10 (b) 6 and 4 (c) 5 and 1 (d) 1 and 25

Q.15. Consider the matrix $P = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$.The value of e^P is

$(a) \begin{bmatrix} 2e^{-2} - 3e^{-1} & e^{-1} - e^{-2} \\ 2e^{-2} - 2e^{-1} & 5e^{-2} - e^{-1} \end{bmatrix}$

$(b) \begin{bmatrix} e^{-1} + e^{-2} & 2e^{-2} - e^{-1} \\ 2e^{-1} - 4e^{-2} & 3e^{-1} + 2e^{-2} \end{bmatrix}$

$(c) \begin{bmatrix} 5e^{-2} - e^{-1} & 3e^{-1} - e^{-2} \\ 2e^{-2} - 6e^{-1} & 4e^{-2} + e^{-1} \end{bmatrix}$

$(d) \begin{bmatrix} 2e^{-1} - e^{-2} & e^{-1} - e^{-2} \\ -2e^{-1} + 2e^{-2} & -e^{-1} + 2e^{-2} \end{bmatrix}$

Q.16 Cauchy's integral theorem is

$(a)\ f(z_0) = \frac{1}{2\pi i} \int_C \frac{f(z)}{z - z_0} dz$

$(b) \oint_C f(z) dz = 0$

$(c) \int_{C_1} f(z) dz = \int_{C2} f(z) dz$

$(d) \int_C \frac{f(z)}{(z - z_0)^n} dz = \frac{2\pi i}{(n-1)!} f^{n-1}(z_0)$

Q.17 The region of validity for Taylor's series about z = 0 of the function ez is

(a) |z| = 0 (b) |z| < 1 (c) |z| < ∞ (d) |z| > 1

Q.18. The region of validity of 1/(1+ z) for it's Taylor's series expansion about z = 0 is

(a) |z| < 1 (b) |z| > 1 (c) |z| = 1 (d) 0

Q.19.. The expansion of 1/ (z −2) is valid for

(a) |z| < 1 (b) |z| < 2 (c) |z| > 3 (d) None of these

Q.20. The probability that A passes a test is $\frac{2}{3}$ and the probability that B passes the same test is $\frac{3}{5}$ .The probability that only one of them passes is

(a) $\frac{2}{5}$ (b) $\frac{4}{15}$ (c) $\frac{2}{15}$ (d) $\frac{7}{15}$

Q.21. A buys a lottery ticket in which the chance of winning is $\frac{1}{10}$;B has a ticket in in which his chance of winning is $\frac{\mathbf{1}}{\mathbf{20}}$.The chance that at least one of them wins is

(a) $\frac{1}{200}$ (b) $\frac{29}{200}$ (c) $\frac{30}{200}$ (d) $\frac{170}{200}$

Q.22. The probability of getting 2 or 3 or 4 from a throw of single dice is

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$ (c) $\frac{2}{6}$ (d) $\frac{4}{6}$

Q.24. Total number of events in a rolling of an ideal die is

(a) 1 (b) 2 (c) 4 (d) 6.

Q.25.The mean of a binomial distribution with n observations and probability of success p is

(a) pq (b) np (c) $\sqrt{np}$ (d) $\sqrt{pq}$

Q.26.For a normal distribution $\beta_1 \text{ and } \beta_2$ are

(a) 0 ,3 (b) 0,2 (c) 1,3 (d) 2,3

Q.27 Compute Spearman's rank correlation coefficient from the following data

X	18	20	34	52	12

Y	39	23	35	18	46

0.8 (b) - 0.9 (c) - 1 (d) 2.1

Q.28 Calculate the coefficient of correlation between X and Y from the following data:

X	3	5	4	6	2
Y	3	4	5	2	6

(a) 0.7 (b) - 0.9 (c) - 1 (d) – 0.7

Q.29 The regression lines of a sample are $x + 6y = 6$ and $3x + 2y = 10$ .Find sample means $\bar{x}\ and\ \bar{y}$

(a) 2 and 1 (b) 3 and 4 (c) 3 and 1/2 (d) 1 and 3

Q.30. If F does not contain x explicitly then Euler's Differential equation reduces to

a) $y - \frac{d}{dx}\left(\frac{\partial F}{\partial y'}\right) = 0$ $b)$ $F - y'\left(\frac{\partial F}{\partial y'}\right) = 0$ $c)$ $F - y'\left(\frac{\partial F}{\partial y'}\right) = c$

d) none of these

Q.31. The Brachistocrome problem is

a) Shortest Distance Problem b) Minimal Surface area Problem c) Shortest Time Problem d) none of these

Q.32. The extremals of $\int_{x_1}^{x_2} \frac{y'^2}{x^2} dx$ is

a) y = c1 x + c2 b) y = c1 x3 + c2 c) y = c1 x2 + c2 d) none of these