BRAINWARE UNIVERSITY

Term End Examination 2021 - 22
Programme – Bachelor of Science (Honours) in Computer Science
Course Name – Mathematics-III
Course Code - GEBS302
(Semester III)

Time : 1 Hr.15 Min.

Full Marks : 60

[The figure in the margin indicates full marks.]

Group-A

(Multiple Choice Type Question) 1 x 60=60

Choose the correct alternative from the following :

(1) Which of the following is a polynomial of degree zero?

a) $a(\neq 0)$
b) 0
c) x
d) None of these

(2) If $f(x)$, $g(x)$ are polynomials of degree m and n respectively. Then the degree of $f(x)g(x)$ is

a) mn
b) m+n
c) undefined
d) None of these

(3) If $x-\alpha$ is a factor of $f(x)$ then value of $f(\alpha)$ is

a) 1
b) 0
c) No conclusion
d) None of these

(4) If $p(x) = ax^2 + bx + c$ is a polynomial of degree 2, then $\frac{c}{a}$ is equal to

a) 0
b) 1
c) Sum of zeroes
d) Product of zeroes

(5) A polynomial of degree n have

a) only 1 zero
b) exactly n zeroes
c) at most (n-1) zeroes
d) more than n zeroes

(6) The degree of $p(x) = x + \sqrt{x}$ is

a) 0
b) 2
c) 4
d) Degree not assigned to it

(7) The polynomial $ax^2 + bx + c$, a is unequal to 0, is a

a) linear
b) quadratic
c) cubic
d) biquadratic

(8) If x -2 is a factor of $x^3 - 2ax^2 + 16$, then value of a is

a) 3
b) 1
c) 4
d) None of these

(9) If $(x-\beta)^2(x-\alpha)^3$ is a factor of a polynomial $f(x)$ of degree 5. Then the order of α in the equation $f''(x) = 0$ is

a) 0
b) 1
c) 2
d) None of these

(10) Every algebraic equation of degree 'n' has exactly

a) n roots
b) n-1 roots
c) n+1 roots
d) None of these

(11) Maximum number of negative roots of the equation $x^3 + x - 3 = 0$ is

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

(12) The number of complex roots of the equation $x^{2020} + 1 = 0$ is

a) 0
b) 2020
c) 2021
d) None of these

(13) The discriminant D of a quadratic equation is_____whenever the roots are unequal an d real.

a) less than 0
b) less than and equal to 0
c) greater than 0
d) greater than equal to 0

(14) The equation whose roots are reciprocal of those of $x^3 + 2x - 3 = 0$ is

a) $x^3 + 2x - 3 = 0$
b) $x^3 - 2x + 3 = 0$
c) $x^3 + \frac{1}{2}x - \frac{1}{3} = 0$
d) $3x^3 - 2x^2 - 1 = 0$

(15) Which of the following equation is a reciprocal equation and of first type?

a) $x^3 - 1 = 0$
b) $x^3 + 1 = 0$
c) $x^3 + x + 3 = 0$
d) None of these

(16) If $c_1(1,0,0) + c_2(0,1,0) + c_3(0,0,1) = (0,0,1)$ Then c_1, c_2 and c_3 are respectively

a) 0,0,0
b) 0,1,0
c) 0,0,1
d) 1,1,1

(17) $S = \{(x, y, 0) \mid x, y \in R\}$ is a subspace of R^3 then dim(S) is

a) 2
b) 3
c) 5
d) None of these

(18) The expression of the vector (7,11) as a linear combination of the vectors (2,3) and (3, 5) is

a) 1(2,3)+2(3,5)

b) 2(2,3)+1(3,5)

c) cannot be expressed

d) None of these

(19) $S = \left\{ \begin{pmatrix} x_1 & 0 \\ 0 & x_2 \end{pmatrix} \mid x_1, x_2 \in R \right\}$. then dim(S) is

a) 2

b) 3

c) 5

d) None of these

(20) The vectors (2,1,0),(1,1,0),(4,2,0) of R^3 are

a) linearly dependent

b) basis

c) linearly independent but not a basis

d) None of these

(21) Which of the following is not a subspace of R^2 ?

a) $\{(x,0): x \in R\}$

b) $\{(0,y): y \in R\}$

c) $\{(x,1): x \in R\}$

d) $\{(x,y): x = y; x, y \in R\}$

(22) Let V and W be two vector spaces and $T: V \to W$ is a linear mapping, then T is inject ive if and only if

a) Ker T=$\{\theta\}$

b) Ker T=$\{0\}$

c) Ker T=V

d) None

(23) Let V and W be two vector spaces and $T: V \to W$ is a linear mapping and θ, θ^1 be th e null vectors of V and W respectively, then

a) $Ker\ T = \{\alpha \in V \mid T(\alpha) = \theta\}$

b) $Ker\ T = \{\alpha \in V \mid T(\alpha) = \theta^1\}$

c) $Ker\ T = \{\alpha \in V \mid T(\alpha) = \alpha\}$

d) None of these

(24) Let $T: R^3 \to R^2$ be a linear transformation defined by $T(x,y,z) = (x-y, x-z)$, then t he dimension of the nullspace of T is

a) 0

b) 1

c) 2

d) 3

(25) If S is a subspace of a vector space $(V,+,.)$ over R, where R is the set of all real numb ers. Then which of the following statement is false.

a) $\alpha + \beta \in S$ *whenever* $\alpha, \beta \in S$

b) $\alpha + 2\beta \in S$ *whenever* $\alpha, \beta \in S$

c) $-\alpha + \beta \in S$ *whenever* $\alpha, \beta \in S$

d) None of these are false

(26) A vector space V is finite dimensional if it has

a) finite basis

b) finite elements

c) no basis

d) None of these

(27) In a vector space V over R. Let $\alpha \in V$ and $a \in R$. Then which is true?

a) $a\alpha \in V$

b) $a + \alpha \in V$

c) $\alpha^2 \in V$

d) $a \in V$

(28) Which of the following is not linear transformation?

a)

b)

$T: R^2 \rightarrow R^2$:
$T(x, y) = (3x - y, 2x)$

$T: R^3 \rightarrow R^2 : T(x, y, z) = (3x+1, y-z)$

c) $T: R \rightarrow R^2 : T(x) = (5x, 2x)$

d) $T: R^3 \rightarrow R^2 : T(x, y, z) = (x, 0, z)$

(29) Let I be the identity transformation of the finite dimensional vector space V, then the nullity of I is

a) dim(V)

b) 0

c) 1

d) dim(V) - 1

(30) Let $T: V \rightarrow W$ be a liner transformation and rank(T)=m, then

a) dim(V) = m

b) dim(Ker T) = m

c) dim(Im T) = m

d) dim(W) = m

(31)

$$M_1 : T : R^3 \rightarrow R^2, T(x, y, z) = (y-1, x+z)$$

$$M_2 : T : R^2 \rightarrow R, T(x, y) = 2xy$$

$$M_3 : T : R^3 \rightarrow R^2, T(x, y, z) = (|y|, 0)$$

Consider the mapping

Which of the above is a linear transformation?

a) only M_2 and M_3

b) only M_3

c) all M_1, M_2 and M_3

d) None of these

(32) Which of the following is the linear transformation from R^3 to R^2?

(i) $f\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ x+y \end{pmatrix}$

(ii) $g\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} xy \\ x+y \end{pmatrix}$

(iii) $h\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} z-x \\ x+y \end{pmatrix}$

a) only f

b) only g

c) only h

d) all the transformations f,g,h

(33) Which of the following subsets of R^4?

$$B_1 = \{(1,0,0,0),(1,1,0,0),(1,1,1,0),(1,1,1,1)\}$$

$$B_2 = \{(1,0,0,0),(1,2,0,0),(1,2,3,0),(1,2,3,4)\}$$

$$B_3 = \{(1,2,0,0),(0,0,1,1),(2,1,0,0),(-5,5,0,0)\}$$

a) B_1 and B_2 but not B_3

b) B_1, B_2 and B_3

c) B_1 and B_3 but not B_2

d) All of B_1 B_2 and B_3

(34) Let $V = M_{2,2}$. The coordinate vector [A] of $A = \begin{bmatrix} 3 & -5 \\ 6 & 7 \end{bmatrix}$ relative to S where

$$S = \left\{ \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}, \begin{bmatrix} 1 & -1 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}, \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \right\}$$ is

a) [7,-1,-13,10]

b) [7,1,13,10]

c) [-7,1,13,-10]

d) Both [7,-1,-13,10] and [-7,1,13,-10]

(35) Let W_1 and W_2 be subspaces of a vector space V having dimensions m and n, respec tively, where $m > n$, then

a) $\dim(W_1 \cap W_2) = n$

b) $\dim(W_1 \cap W_2) = m$

c) $\dim(W_1 \cap W_2) \le n$

d) $\dim(W_1 \cap W_2) \le m$

(36) Define $T : \mathbb{R}^2 \to \mathbb{R}^2$ by $T(a_1, a_2) = (a_1, -a_2)$. Then

a) T is called the reflection about the y -axis

b) T is called the reflection about the x -axis

c) T is called the projection on the x -axis

d) T is called the projection on the y -axis

(37) Let V and W be vector spaces, and let $T : V \to W$ be linear. If V is finite-dimensional, then

a) nullity(T) - rank(T) = dim(V)

b) nullity(T) + rank(T) = dim(V)

c) nullity(T) - rank(T) < = dim(V)

d) nullity(T) + rank(T) <=dim(V)

(38) Let V and W be vector spaces, and let $T : V \to W$ be linear. If $N(T) = \{0\}$ then

a) T is injective

b) T is surjective

c) T is bijective

d) Can not be decided

(39) Let V and W be finite dimensional real vector spaces. Let $T : V \to W$ be a linear trans formation. If rank of T is 3 and nullity of T is 4, the dimension of V is

a) 7

b) 3

c) 4

d) 1

(40) If $A^2=A$, then its Eigen values are either

a) 0 or 2
b) 1 or 2
c) 0 or 1
d) Only 0

(41) If $\lambda \neq 0$ is an Eigen value of a matrix A then the matrix A^T has an Eigen value

a) λ
b) $-\lambda$
c) $\frac{1}{\lambda}$
d) Can Not be determined

(42) If A has an Eigen vector v and $A=P^{-1}BP$ then B has an Eigen vector

a) Pv
b) $P^{-1}v$
c) v
d) v^{-1}

(43) If α is an Eigen value and v is the corresponding Eigen vector of a matrix A then whi ch of the following is false

a) $Av=\alpha I$
b) $Av=\alpha v$
c) $A^{-1}v=\frac{1}{\alpha}v$
d) Any one of these is false

(44) If $V=R^3$ be equipped with inner product $(x,y)=x_1y_1+2x_2y_2+3x_3y_3$. In this inner p roduct space $(V,(.,.))$ then the value of the inner product of $u=\begin{bmatrix}1\\1\\\frac{1}{\sqrt{3}}\end{bmatrix}, v=\begin{bmatrix}0\\\frac{1}{2}\\\frac{1}{\sqrt{3}}\end{bmatrix}$

a) $\frac{2}{\sqrt{2}}$
b) $2\sqrt{2}$
c) 2
d) $\frac{\sqrt{3}}{2}$

(45) If λ is the only Eigen value (real or complex) of an $n\times n$ matrix A then det A=

a) λ
b) λ^n
c) $n\lambda$
d) $n\lambda^{n-1}$

(46) For the matrix $A=\begin{pmatrix}1 & 1 & -1\\-2 & 3 & 0\\-2 & 1 & 2\end{pmatrix}$, the eigen vector corresponding to the eigen value 3 is

a) (0,1,1)
b) (1,2,1)
c) (1,1,1)
d) None of these

(47) Let $A=\begin{pmatrix}1 & 0 & 1\\0 & 1 & 1\\1 & 0 & 1\end{pmatrix}$, then $\dim\left(span\left\{\begin{pmatrix}1\\0\\1\end{pmatrix},\begin{pmatrix}0\\1\\2\end{pmatrix},\begin{pmatrix}1\\1\\1\end{pmatrix}\right\}\right)=$

a) 1
b) 2

c) 3

d) 0

(48) An orthogonal matrix A has eigen values of 1, 2 and 4. The trace of the matrix A^T is

a) 7/4

b) 1/7

c) 7

d) 4/7

(49) Consider the inner product space of all polynomial of degree less than or equal to 3 and the inner product $f(x).g(x) = \int_{-1}^{1} f(x)g(x)dx$ then the value $x.x^3$

a) 1/4

b) 1/5

c) 2/5

d) 0

(50) If a line makes angles 90°, 135°, 45° with the x, y and z-axes respectively, then its direction cosines are

a) $0, -\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$

b) $0, \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$

c) 0,-1,1

d) 0,1,-1

(51) If a line has the direction ratios − 18, 12, −4 then what are its direction cosines?

a) $\frac{9}{11}, \frac{6}{11}, \frac{2}{11}$

b) $-\frac{9}{11}, -\frac{6}{11}, -\frac{2}{11}$

c) $-\frac{9}{11}, \frac{6}{11}, -\frac{2}{11}$

d) None of these

(52)

a) 1,0,0; 0,1,0; 0,0,1

b) 0,1,1; 1,0,1; 1,1,0

c) 1,1,1; 1,1,0; 1,0,0

d) None of these

(53) If a line has direction ratios 2, – 1, – 2, then its direction cosines will be

a) $\frac{2}{3}, \frac{1}{3}, \frac{2}{3}$

b) $\frac{2}{3}, -\frac{1}{3}, -\frac{2}{3}$

c) $-\frac{2}{3}, \frac{1}{3}, \frac{2}{3}$

d) None of these

(54) Two straight lines with direction cosines l_1, m_1, n_1 and l_2, m_2, n_2 are parallel if

a) $l_1 l_2 + m_1 m_2 + n_1 n_2 = 0$

b) $\frac{l_1}{l_2} + \frac{m_1}{m_2} + \frac{n_1}{n_2} = 0$

c) $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$

d) $l_1 l_2 = m_1 m_2 = n_1 n_2$

(55) Let PQ be the line through the points (4, 7, 8) and (2, 3, 4), XY be the line through the points, (-1, -2, 1) and (1, 2, 5).

a) PQ & XY are perpendicular

b) PQ & XY are parallel

c) PQ & XY are same line

d) None of these

(56) Equation of the straight line passing through (x_1,y_1,z_1) and (x_2,y_2,z_2) is

a) $\frac{x-x_1}{x_1-x_2} = \frac{y-y_1}{y_1-y_2} = \frac{z-z_1}{z_1-z_2}$

b) $\frac{x-x_1}{y_1-y_2} = \frac{y-y_1}{z_1-z_2} = \frac{z-z_1}{x_1-x_2}$

c) $\frac{x-x_1}{z_1-z_2}=\frac{y-y_1}{x_1-x_2}=\frac{z-z_1}{y_1-y_2}$

d) None of these

(57)

The angle between the pair of lines $\frac{x+3}{3}=\frac{y-1}{5}=\frac{z+3}{4}$ and $\frac{x+1}{1}=\frac{y-4}{1}=\frac{z-5}{2}$ is

a) $\cos^{-1}\left(\frac{8}{5}\right)$

b) $\cos^{-1}\left(\frac{8\sqrt{3}}{15}\right)$

c) $\cos^{-1}\left(\frac{8\sqrt{3}}{5}\right)$

d) None of these are false

(58)

The lines $\frac{x-5}{7}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are

a) perpendicular

b) parallel

c) same line

d) None of these

(59)

The shortest distance between the lines $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$ and $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ is

a) $\sqrt{29}$

b) $-\sqrt{29}$

c) $2\sqrt{29}$

d) $-2\sqrt{29}$

(60) The coordinates of the foot of the perpendicular drawn from the origin to the plane 2x − 3y + 4z − 6 = 0

a) $\left(\frac{12}{29},\frac{18}{29},\frac{24}{29}\right)$

b) $\left(-\frac{12}{29},\frac{18}{29},\frac{24}{29}\right)$

c) $\left(\frac{12}{29},-\frac{18}{29},\frac{24}{29}\right)$

d) $\left(\frac{12}{29},\frac{18}{29},-\frac{24}{29}\right)$