GOVT.(AUTO) COLLEGE ROURKELA

Sub- Mathematics,Paper-C-2

Q.1 Answer the followings

(a) If p and q are two statements then $p \to q$ is equivalent to ———————

(b) The contrapositive of the inverse $p \to \sim q$ is ———————

(c) The statement $p \to (q \to p)$ is equivalent to ——————

(d)If $\emptyset$ denotes the empty set then $p(p(p(\emptyset)) =$ ——————

(e)Out of 200 students in a class, 120 passed in physics, 140 in mathematics, 40 failed in both subjects then number of students passed in both ————————————

(f)If $f(x) = \cos(\log x)$ then find $f(\frac{x}{y}) + f(\frac{y}{x})$

(g)If $g(x) = x^2 + x - 2$ and $\frac{1}{2}(gof)(x) = 2x^2 - 5x + 2$ find $f(x)$

(h)Define null graph.

(i) Define Plannar graph.

(j)If a set has n elements then number of elements from A to A = ————

(k)Define connected graph.

(l) Define bijective mapping

(m) Every function is a relation (T/F)

(m)Define pigeonhole principle.

(o) Sum of degrees of all the vertices is equal to ———————

(p)Define complete graph.

(q) A function which is one-one and onto is called ———————

(r) write the condition for a valid statement.

(s) If f is one-one and g is onto then gof is —————

(t)If A, B,C are any three sets then $(A-B)\times C =$ ——————

Q.No-2

(a) In how many ways can three letters be posted in six letter boxes.

(b)Give an example of a relation which is partial ordering.

(c)Write the quotient and remainder when -400 is divided by -13.

(d)The remainder when 2^6-1 is divisible by 7.

(e)If $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ Find the value of $A^2 - 2A + I$

(d)If $A = A^{-1}$ then find the value of A^2

(e)Find the sum of eigen values of $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

(f) If $A = \begin{bmatrix} 6 & 1 & 4 \\ 2 & 3 & 1 \\ 1 & 3 & 7 \end{bmatrix}$ then find trace of A

(g) If C(n 2) = 56 find the value of n.

(f) Define bi-partite graph.

(h)Find the minimum number of edges in a connected graph with n-vertices.

(i)Find the rank of the matrix $A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$

(j) Define rank of matrix.

Q.No-3

(a) Find the characteristics equation of the matrix $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$

(b)Write short notes on

(i)Incidence matrix (ii) Adjacency matrix (iii)Hamiltonian path

(c)State and prove Euler's formula

(d)Find a 2×2matrix B such that $B\begin{bmatrix} 1 & 2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$

(e) Define isomorphic graph. Write the condition for two graph two be isomorphic.

(f)A connected planar graph has 10 vertices of degree 3 .Into how many regions does a representation of this planar graph splits the plane.

(g)Find the characteristics polynomial, characteristics equation and eigen values of the $\begin{bmatrix} 2 & 7 \\ 7 & 2 \end{bmatrix}$

(h) Test the consistency of the equation and solve $5x + 3y + 2z = 1$, $3x + 2y + 7z = 4$, $4x - 2y + 5z = 8$

(i)Find the inverse of $A = \begin{bmatrix} 1 & 0 & 3 \\ 0 & 2 & 6 \\ 2 & 0 & 3 \end{bmatrix}$ by elementary row operation.

(j)Find the rank of the matrix $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 2 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 \end{bmatrix}$

Q.No-4

(a)How many solutions does the equation $x_1 + x_2 + x_3 = 11$ have , where x_1, x_2 and x_3 are non-negative Integers?

(b) How many different strings can be made by reordering the letters of the word SUCCESS.

(c)Find all solutions of the recurrence relations $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$ with initial condition $a_0 = 2$, $a_1 = 5$ and $a_2 = 15$.

(d)Use generating function to solve recurrence relation $a_k = 5a_{k-1} - 6a_{k-2}$ with initial condition $a_0 = 2$, $a_1 = 5$.

(e)Reduce to echelon form and find its rank $\begin{bmatrix} 1 & 3 & 5 \\ 2 & 1 & 2 \\ 0 & 5 & 12 \end{bmatrix}$

(f) Test the consistency and solve $x + y + z = -11$, $6x + 20y - 3z = -4$, $-x - 4y + 9z = 18$

(g) Find the rank of the matrix $A = \begin{bmatrix} 1 & 0 & 1 & 1 \\ 3 & 2 & 5 & 1 \\ 0 & 4 & 4 & -1 \end{bmatrix}$ by echelon form.

(h)If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$ prove that $A^3 = A^{-1}$

(i) If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$, $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$ verify that $(AB)^T = B^T A^T$

(j)Evaluate $A^2 - 3A + 9I$ if $A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$

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