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//Created By Ritwik Chandra Pandey
//On 4th Nov
//Implementing a undirected graph and its operations using adjacency matrix


#include<stdio.h>
#include<stdlib.h>


int graph [20][20];
void print(int * N) {
	int i,j;
	if(*N == 0){
		printf("Graph is empty.\n");
		return;
	}
	for(i=1;i<=*N;i++){
		for(j=1;j<=*N;j++){
			printf("%d\t",graph[i][j]);
		}
		printf("\n");
	}
}

void insertVertex(int * N) {
	int x[10],y[10],t,i,s;
	*N = *N-1;
	printf("Enter the number of edges from existing vertices to new vertex : ");
	scanf("%d",&s);
	for(i=1;i<=s;i++){
		scanf("%d",&x[i]);}
	printf("Enter the number of edges that are from new vertex to existing vertices : ");
	for(i=1;i<=t;i++){
		scanf("%d",&y[i]);
	}
	for(i=1;i<=*N;i++){
		graph[i][*N] = 0;
		graph[*N][i] =0;
	}
	for(i=1;i<=s;i++){
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                if(x[i]<*N){
                        graph[x[i]][*N] = 1;
                        graph[*N][x[i]] = 1;
                }
                else{
                        printf("Invalid vertex.\n");
                }
        }
        for(i=1;i<=t;i++){
                if(y[i]<*N){
                        graph[*N][y[x[i]]] = 1;
                }else{
                        printf("Invalid vertex.\n");
                }
        }
        printf("After inserting vertex the adjacency matrix is : \n");
        print(N);
}
void insertEdge(int *N){
        int v1,v2;
        printf("Enter the source vertex of the edge : ");
        scanf("%d",&v1);
        printf("Enter the destination vertex of the edge : ");
        scanf("%d",&v2);
        if(v1<=*N && v2<=*N){
                graph[v1][v2] = 1;
                graph[v2][v1] = 1;
        }else{
                printf("Invalid vertex.\n");
                return;
        }
        printf("After inserting edge the adjacency matrix is : \n");
        print(N);
}
void deleteVertex(int *N) {
        int vd,i,j,k;
        if(*N==0){
                printf("Graph is empty.\n");
                return;
        }
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	printf("Enter the vertex to be deleted : ");
	scanf("%d",&vd);
	if(vd>*N){
		printf("Invalid vertex.\n");
		return;
	}
	j = vd;
	for(i=j;i<=*N - 1;i++){
		for(k = 1;k<=*N;k++){
			graph[k][i] = graph[k][i+1];
		}
	}
	for(i=j;i<=*N-1;i++){
		for(k=1;k<=*N;k++){
			graph[i+1][k] = graph[i][k];
		}
	}
	*N = *N-1;
	printf("After deleting vertex the adjacency matrix is : \n");
	print(N);
}
void deleteEdge(int *N) {
	int v1,v2;
	printf("Enter the source vertex of the edge : ");
	scanf("%d",&v1);
	printf("Enter the destination vertex of the edge : ");
	scanf("%d", &v2);
	if(v1<=*N && v2<=*N){
		if(graph[v1][v2] == 0){
			printf("Edge does not exist.\n");
			return;
		}
		graph[v1][v2] = 0;
		graph[v2][v1] = 0;
	}else{
		printf("Invalid vertex.\n");
		return;
	}
	printf("After deleting edge the adjacency matrix is : \n");
	print(N);
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}

void main() {
	int x, op;
	int N,E,s,d,i,j;
	printf("Enter the number of vertices : ");
	scanf("%d",&N);
	printf("Enter the number of edges : ");
	scanf("%d",&E);
	for(i=1;i<=E;i++) {
		printf("Enter source : ");
		scanf("%d",&s);
		printf("Enter destination : ");
		scanf("%d",&d);
		if(s > N && d > N) {
			printf("Invalid index. Try again.\n");
			i--;
			continue;
		} else {
			graph[s][d] = 1;
			graph[d][s] = 1;
		}
	}
	while(1)
	{
		printf("1.Insert vertex 2.Insert edge 3.Delete vertex 4.Delete edge 5.Print adjacency matrix 6.Exit\n");
		printf("Enter your option : ");
		scanf("%d", &op);
		switch(op) {
			case 1:
				insertVertex(&N);
				break;
			case 2:
				insertEdge(&N);
				break;
			case 3:
				deleteVertex(&N);
				break;
			case 4:
				deleteEdge(&N);
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                        break;
                case 5:
                        print(&N);
                        break;
                case 6:
                        exit(0);
                }
        }
}
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