```
def encrypt_zigzag(text, key):
    text = text.replace(' ', '').upper()
    num_rows = key
    num_cols = len(text)

    rail = [['\n' for _ in range(num_cols)] for _ in range(num_rows)]

    row, col = 0, 0
    dir_down = False

    for char in text:
        if (row == 0) or (row == num_rows - 1):
            dir_down = not dir_down

        rail[row][col] = char
        col += 1

        if dir_down:
            row += 1
        else:
            row -= 1

    result = []
    for i in range(num_rows):
        for j in range(num_cols):
            if rail[i][j] != '\n':
                result.append(rail[i][j])
    return "".join(result)

print("Fonction de chiffrement zigzag")
```

```
Fonction de chiffrement zigzag
```

```
def decrypt_zigzag(cipher, key):
    num_rows = key
    num_cols = len(cipher)

    rail = [['\n' for _ in range(num_cols)] for _ in range(num_rows)]

    row, col = 0, 0
    dir_down = False

    for _ in range(num_cols):
        if (row == 0) or (row == num_rows - 1):
            dir_down = not dir_down

        rail[row][col] = '*'
        col += 1

        if dir_down:
            row += 1
        else:
            row -= 1

    index = 0
    for i in range(num_rows):
        for j in range(num_cols):
            if (rail[i][j] == '*') and (index < len(cipher)):
                rail[i][j] = cipher[index]
                index += 1

    result = []
    row, col = 0, 0
    dir_down = False

    for _ in range(num_cols):
        if (row == 0) or (row == num_rows - 1):
            dir_down = not dir_down

        if rail[row][col] != '*':
            result.append(rail[row][col])
        col += 1

        if dir_down:
            row += 1
        else:
            row -= 1
    return "".join(result)

print("Fonction de déchiffrement zigzag")
```

```
Fonction de déchiffrement zigzag
```

```
original_text = "INFRES17"
key = 3

encrypted_text = encrypt_zigzag(original_text, key)
print(f"Texte original: {original_text}")
print(f"Texte chiffré (clé={key}): {encrypted_text}")

decrypted_text = decrypt_zigzag(encrypted_text, key)
print(f"Texte déchiffré (clé={key}): {decrypted_text}")

original_text_2 = "VIVE LA CRYPTOGRAPHIE"
key_2 = 4

encrypted_text_2 = encrypt_zigzag(original_text_2, key_2)
print(f"\nTexte original: {original_text_2}")
print(f"Texte chiffré (clé={key_2}): {encrypted_text_2}")

decrypted_text_2 = decrypt_zigzag(encrypted_text_2, key_2)
print(f"Texte déchiffré (clé={key_2}): {decrypted_text_2}")
```

```
Texte original: INFRES17
Texte chiffré (clé=3): IENRS7F1
Texte déchiffré (clé=3): INFRES17

Texte original: VIVE LA CRYPTOGRAPHIE
Texte chiffré (clé=4): VCGEIARORIVLYTAHEPP
Texte déchiffré (clé=4): VIVELACRYPTOGRAPHIE
```