Answers Link: https://docs.google.com/document/d/11HFhhLBs17iRKBpiIj9-D\_j7ygN26D6C3upbB7VHgVE/edit#heading=h.7zwurdslnlif

CS 120 Finals Practice Paper By Jun Ming: (Total marks: 149)

For all questions, if not compliable, put NC. If run-time error, put RTE. If the answer is not-known or ambiguous, write AMBI. Assume all flags are turned on.

Part 1: Short Structured Questions (Total marks: 113)

Question 1: What are the outputs of the following functions?

a) (1 mark)

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| --- |
| int i = 5;  float j = 6.2657f;  printf("%-3d, %.3f", i, j); |

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b) (1 mark)

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| --- |
| int x = 10; // The address of X is 1000  int\* y = &x; // The address of Y is 992  printf("|%d, %d|", (int)y, \*y + 5); |

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c) (1 mark)

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| --- |
| int a[6] = { 1, 2, 3, 4, 5, 6 }; // The address of a is 1000  char\* ptr = (char\*)(a + 2);  printf("%d, %d", ++ptr, \*&(\*(a + 3)) + 3); |

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d) (1 mark)

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| --- |
| const char\* string = "abcd\0dced\0";  printf("%s, %s", string, string + 4); |

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Question 2: What does printf return? (1 mark)

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Question 3: What are the respective values after the scanf?

a) (1.5 mark)

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| --- | --- |
| Input: 2, c  int x, y, z;  z = scanf("%d, %d", &x, &y); | Value of x: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of y: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of z: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

b) (1 mark)

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| --- | --- |
| Input: 5, 6  int a = 5;  int \* b = &a;  scanf("%d, %d", &a, b); | Value of a: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of b: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

c) (2.5 mark)

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| --- | --- |
| Input: hello c 5.789  char str[100];  char c;  int x = 6;  float y = 7.0f;  scanf("%s%c%d%f", str, &c, &x, &y); | The string in str: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of c: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of x: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Value of y: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

Question 4: What is the output of the code? If it does not compile, why?

a) (1 mark)

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| --- |
| char\* x = "str";  switch (x)  {  case "hello":  printf("1");  break;  case "str":  printf("2");  } |

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b) (1 mark)

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| --- |
| int z = 7;  int y = 6;  int x = 5;  switch (x)  {  case y:  case x:  printf("1");  case z:  printf("2");  } |

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c) (1 mark)

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| --- |
| int x = 7;  switch (x)  {  case 1:  case 2 \* 3:  printf("1");  case 2 \* 3 + 1:  printf("hello");  break;  printf("2");  case 2 \* 3 - 1:  printf("3");  } |

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Question 5:

a) Convert the following code into only using while loops only (2 marks)

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| for (i = 0; i < 7; ++i)  {  for (j = i + 1; j < 7; ++j)  {  if ((j + i) % 3 == 0)  {  printf("%d-%d ", i, j);  }  }  } |

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b) What is the output of the code? (3.5 marks)

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Question 6: What is the output of the following code? (2 mark)

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| --- |
| int i = 2;    if (--i % 3)  if (i -= 1)  printf("Hello");  else  printf("Is it me?: %d", i);  else  printf("Or me?: %d", i); |

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Question 7: What is the output of the following code? (4 mark)

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| --- |
| int i = 0;  int j = 1;  int result = 0;  for (i = 0; i < 5; ++i)  {  if (i % 2 == 1)  {  while (j <= i)  {  result += i % (j++);  }  }  else  {  result += j;  j = 1;  }  }  printf("%d, %d, %d", result, i, j); |

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Question 8: What is the output of the following code? (5 mark)

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| --- |
| int x = 3;  int y = 5;  void foo(int x, int j)  {  x += 7;  y += j++;  }  int main()  {  int z = 7;  {  int y = 2;  printf("%d ", y);  }    {  int z = 2;  {  int x = y;  z += ++x;  foo(2, 3);  printf("%d ", x);  }  }  z += y;  printf("%d %d %d ", x, y, z);  } |

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Question 9: What is the printout of the following codes? Each part carries on to the next one. Means part a affect part b and so on.

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| --- |
| int a = 6, b = 1, c = 2, d = 0, e = 5; |

a) (4 marks)

|  |
| --- |
| printf("%d: ", a-- - ++e && (d += 2) || b - ++c);  printf("%d, %d, %d, %d, %d", a, b, c, d, e); |

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b) (4 marks)

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| --- |
| printf("%d: ", a = a < b || c-- == (e -= 3 \* b) && ++d);  printf("%d, %d, %d, %d, %d", a, b, c, d, e); |

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c) (4 marks)

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| --- |
| printf("%d: ", (((a += b) && (++c, --d), e), ++e || c));  printf("%d, %d, %d, %d, %d\n", a, b, c, d, e); |

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Question 10: Rewrite the follow code into using ternary operation only (2 marks)

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| --- |
| if (x > 6)  {  y += 7;  }  else if (x < 3)  {  y -= 8;  } |

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Question 11: Rewrite the following codes into a single line without using ternary, if-else or loops

a) (1 mark)

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| --- |
| if (i < 3)  {  i += 2;  } |

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b) (1 mark)

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| --- |
| while (x <= y)  {  ++x;  } |

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| --- |
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c) (2 mark)

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| --- |
| if (x < y)  {  y = 5;  }  else  {  y = x;  } |

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Question 12: Write the function prototype of the following function declarations

a) Foo takes in an integer and float and returns an integer (1 mark)

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| --- |
|  |

b) Boo takes in a pointer to an integer and returns nothing (1 mark)

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c) Goo takes in nothing and return a pointer to a constant float (1 mark)

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d) Doo takes in a constant pointer to a integer and returns nothing (1 mark)

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e) Hoo takes in a pointer to a constant pointer to a double and returns nothing

(1 mark)

|  |
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f) Joo takes in a pointer to an array of 6 floats and returns nothing (1 mark)

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g) Loo takes in a constant pointer to an array of any number of floats and returns nothing (1 mark)

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Question 13: Declare the following arrays and initialize them. Use initialization list if possible. If it can be done in 1 line, do it in that manner.

a) Foo is an array of 6 integers and initialized with all 0 (1 mark)

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| --- |
|  |

b) Goo is an array of 8 integers and the first 4 elements are initialized with 1, 3, 5, 6 respectively (1 mark)

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c) Boo is an array of 100 integers and the elements are all initialized with 2

(2 marks)

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d) Goo is an array of 2 array of 3 integers. The 1st and 2nd element of the 1st array is initialized with 1 and 2. The 1st element of the 2nd array is initialized with 3. The rest are 0. (2 marks)

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e) Loo is an array of 100 array of 10 integers. The elements in the array are initialized from 0 to 999.

Example: Loo[0][0] is 0. Loo[0][9] is 9. Loo[1][0] is 10. (2 marks)

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Question 13: What is wrong with the following code? Why can’t it compile? (1 mark)

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| --- |
| void foo(int(\*ptr)[])  {  ++ptr;  printf("%d", \*\*ptr);  } |

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| --- |
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Question 14: Write the type of the following variables. The first example is given to you. Each question is work 0.5 marks. (6.5 marks)

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| --- |
| int x;  int\* y;  int a[3];  int b[2][3]; |

Example: x - int

a) &x \_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) &y \_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \*y \_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) &\*y \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) &&y \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

f) a + 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) \*a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

h) &a \_\_\_\_\_\_\_\_\_\_\_\_\_\_

i) b \_\_\_\_\_\_\_\_\_\_\_\_\_\_

j) \*b \_\_\_\_\_\_\_\_\_\_\_\_\_\_

k) b + 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_

l) &b \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Question 15: What are the output of the following expressions? Assume memory layout is in little endian format. If unable to compile, write NC. Each question is work 1 mark. (13 marks)

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| --- |
| char a[5] = { 0, 1, 2, 3, 4 }; // Address of a is 1000  char\* p = a + 1;  char\* q = a + 4;  short\* s = (short\*)(a + 4); |

a) p – q \_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) q + p \_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) p – p \_\_\_\_\_\_\_\_\_\_\_\_\_\_  
d) s – p \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) s + 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_

f) p + q – p \_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) q – p + p \_\_\_\_\_\_\_\_\_\_\_\_\_\_

h) p + (q – p) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

i) s + (p – q) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

j) s[-1] \_\_\_\_\_\_\_\_\_\_\_\_\_\_

k) 1[p] \_\_\_\_\_\_\_\_\_\_\_\_\_\_

l) p – 6 - q \_\_\_\_\_\_\_\_\_\_\_\_\_\_

m) p – (6 – q) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Question 16: What is the output of the following code? If there are any errors, why? (5 marks)

|  |
| --- |
| const char\* names[3] = { "csa2lir", "0dpfyi", "1eaa" };  char a[12] = { 0 };  for (int i = 0; i < 11; ++i)  {  if (i % 2)  {  a[i] = names[i / 4][i % 6];  }  else  {  a[i] = names[i % 3][i / 6];  }  }  printf("%s", a); |

|  |
| --- |
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Question 17: What is the output of the following code? If there are any errors, why? (2 marks)

|  |
| --- |
| int i = 0;  int a[6];  int\* ptr = a;  for (i = 0; i < 6; ++i)  {  \*a = i;  ++a;  }  printf("%d", \*(ptr + 3)); |

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| --- |
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Question 18: What is the output of the following code? If there are any errors, why? (3 marks)

|  |
| --- |
| void stringcopy(const char\* source, char\* destination)  {  while (\*source != '\0')  {  \*(destination++) = \*(source++);  }  }  int main(void)  {  char a[] = { "Hello" };  char b[] = { "Superfalicious" };  stringcopy(a, b);  printf("%s, %s", a, b);    return 0;  } |

|  |
| --- |
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Question 19:

a) Is there anything wrong with the code? If so, is it a compile-time error or run-time error and why? (2 marks)

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| --- |
| void foo(int\*\* p1, int\*\* p2)  {  \*(p1) = \*(p2);  }  int main(void)  {  int\* pointer1 = (int\*)malloc(sizeof(float) \* 5);  int\* pointer2 =(int\*)malloc(sizeof(char) \* 8);  foo(&pointer2, &pointer1);  free(pointer1);  free(pointer2);  } |

|  |
| --- |
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b) How many bytes of memory leaks are there in the code? (1 mark)

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Question 20: Which are the following expressions can compile (C) or cannot compile (NC)? Put C or NC. Each question is worth 0.5 marks. (5 marks)

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| --- |
| const int ci = 5;  int i = 6;  const int\* cip = &ci;  int\* ip;  int\* const ipc = &i; |

a) ip = &i \_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) cip = &i \_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) ipc = &i \_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) \*ipc++ \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) cip = ip \_\_\_\_\_\_\_\_\_\_\_\_\_\_

f) ip = cip \_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) cip = ipc \_\_\_\_\_\_\_\_\_\_\_\_\_\_

h) \*cip \_\_\_\_\_\_\_\_\_\_\_\_\_\_

i) ++\*cip \_\_\_\_\_\_\_\_\_\_\_\_\_\_

j) i = ci \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Question 21: Is there anything wrong with this struct? (1 mark)

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| --- |
| struct A  {  int x;  char y;  float z;  struct A a;  }; |

|  |
| --- |
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Question 22: Declare the following struct and initialize its members with 5, 6.0f, 7, ‘c’ respectively. Must be done using 1 line only (2 marks)

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| --- |
| struct hello  {  int x;  float y;  int z;  char c;  }; |

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Question 23: Evaluate the following expressions. Each question is worth 1 mark

(9 marks)

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| --- |
| struct A  {  char c;  short x, y;  };  struct C  {  char c1[3];  char c2[5];  };  struct B  {  double d;  struct A a;  char c[3];  struct C\* c\_obj;  };  int main(void)  {  struct B b; // Address of b is 1000  b.c\_obj = (struct C\*)&(b.a);  for (int i = 0; i < 8; ++i)  {  b.c\_obj->c1[i] = i;  }  return 0;  } |

a) sizeof(struct A) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) sizeof(struct B) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) sizeof(struct C) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) &b.d \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) &b.c[1] \_\_\_\_\_\_\_\_\_\_\_\_\_\_

f) &b.a.c \_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) &b.c\_obj \_\_\_\_\_\_\_\_\_\_\_\_\_\_

h) (\*b.c\_obj).c2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_

i) b.a.x \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part 2: Open-Ended Questions: (Total: 36 marks)

Question 24:

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| --- |
| int\* CreateArray(int num)  {  int a[num];  return a;  } |

a) What is wrong with the following code? (1 mark)

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| --- |
|  |

b) Rewrite the function so that it works properly (2 marks)

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Question 25:

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| --- |
| int main(void)  {  /\* Create a 2D array that is an array of 6 arrays of 5 integers \*/  int height = 6;  int width = 5;  int\*\* array2D = Create2DArray(width, height);  /\* Some coding \*/  FreeArray(array2D, height);  return 0;  } |

a) Write the function definition for Create2DArray (5 marks)

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b) Write the function definition for FreeArray (5 marks)

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Question 26: Write the definition of strlen function used in <string.h> (5 marks)

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Question 27: Write the definition for the function ConcatenateNewString used below. Assume all cleanup are done subsequently. You are only allowed to use strlen function implemented in Q26. Only pointers are allowed. No subscript.

(8 marks)

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| --- |
| // string contains "abcedc"  char\* string = ConcatenateNewString("abc", "edc"); |

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Question 28: Write the definition of the function Swap used below where all the contents of the array are reversed. Only pointers are allowed. Using counters will only result in maximum 5 marks. (10 marks)

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| --- |
| int a[5] = { 1, 2, 3, 4, 5 };  Swap(a, 5); /\* a is now { 5, 4, 3, 2, 1 } \*/ |

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