

Name:

ID Number: (7 points) Exam Number:

Grade: 1: ... 2: ... 3: ... 4: ... 5: ... 6: ... 7: ... 8: ... Total:

SOLVE ALL the problems IN THE SPACE PROVIDED

Read the Problems CAREFULLY!

THERE ARE 5 (FIVE) PAGES THIS PAGE INCLUDED

In the exam, the following matrices will be used. Do not get puzzled if a reference to matrix X , Y or Z or etc arises! If a problem modifies X and then another problem (not a question in a problem) uses X again, for the latter problem ignore the prior modifications; use/read X as it appears on this page not as modified before.

If you are asked to evaluate a MATLAB expression, and you think the result is undefined you could write UNDEFINED instead of giving an answer. For example `five == 5` is UNDEFINED since variable `five` has not been defined.

$$X = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 2 & 0 & 2 \end{bmatrix}, Y = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 2 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}, Z = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 2 \\ 2 & 1 & 1 \end{bmatrix}, R = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, T = [1 \ 0 \ 1 \],$$

Problem 1. (50 POINTS)

Give short answers to the following questions.

- (a) How many bytes in 1KiB?
- (b) Are the two variables `TRUE` and `true` the same or not?
- (c) What is a 1MB?
- (d) How many bytes is a MATLAB `double`?
- (e) How many bytes is a MATLAB `logical`?
- (f) What is the range of values for an 8-bit integer? (give number of values, lowest and highest value in the range.)
- (g) What is matrix element $X(2,2)$?
- (h) What is array element $X(6)$?
- (i) What is array element $Y(8)$?
- (j) Represent decimal 74 in hexadecimal.

Problem 2. (40 POINTS)

Evaluate the following MATLAB expressions. What are the values of a, b, c, d ?

- (i) $a = 2^2 + 2^2^2 - 1$
- (ii) $b = 1 \& \sim 0$
- (iii) $c = 1 == 2$ - `true`
- (iv) $d = 10 < 2 > 0$

Problem 3. (40 POINTS)

(i) List the elements of X in column-major filin/form.

(ii) List the elements of Z in row-major filin/form.

(iii) What is $Z(:, :)$?

(iv) What is the effect of doing $X([2 \ 3], [1 \ 2]) = [100 \ 200; 300 \ 400]$?

(v) What is the effect of doing $K = [10 \ 11; 12 \ 13]$?

Problem 4. (30 POINTS)

(i) What is the effect of doing $P = \text{ones}(3) + \text{eye}(3) + 3$?

(ii) What is the value of `thisvar` after the second statement is executed below? What is it after the third statement is executed?

```
>> thisvar = 10;  
>> thisvar = thisvar*thisvar;  
>> thisvar = thisvar+11;
```

(iii) What are the values of `a`, `b` at the end (last two lines)?

```
>> a=100;  
>> b=200;  
>> t=a; a=b; b=t;  
>> a  
>> b
```

Problem 5. (40 POINTS)

For these calculations the matrices are those of the cover page. (If they have changed in previous problems, disregard those changes as explained in the instructions.)

(i) How much is $X * X$?

(ii) How much is $X ./ Z$?

(iii) How much is $T * R$?

(iv) How much is $X + \text{ones}(3)$?

Problem 6. (40 POINTS)

The 8-bit binary integer 10010101 what decimal integer does it represent if considered: (i) an unsigned integer, (ii) in signed mantissa representation, (iii) one's complement, and (iv) two's complement representations.

Problem 7. (30 POINTS)

(i) What is the result of $Z(3, :) + T$ in MATLAB?

(ii) What is the result of $2 * X + 3 - Z$ in MATLAB?

(iii) What is the result of $X = X >= 2$?

Problem 8. (30 POINTS)

Evaluate the following MATLAB expressions.

(i) $a = 2 + 2 ^ 2 / 2 * 2 - 8 > 4 + 2 * 2$

(ii) $b = -1 - 1 | - 1 + 1 \& - 1.$

(iii) $c = 2 | true | false || (1/0)$

$$X = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 2 & 1 \\ 2 & 0 & 2 \end{bmatrix}, Y = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 1 \\ 2 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}, Z = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 2 \\ 2 & 1 & 1 \end{bmatrix}, R = \begin{bmatrix} 1 \\ 2 \\ 2 \end{bmatrix}, T = [1 \ 0 \ 1 \],$$

Intentionally left blank. Copies of front-page matrices included
You can tear-off this last page and use it as scratch paper; do not turn IT in

End of Exam 1