SEG 3300 Mid-Term

3. (a) Names of Main Actors — Names of Main Use Cases

- borrower
  - request book be put on hold
  - borrow a book
  - search for a book
  - return a book
- (5) ~~librarian~~
- librarian
  - put a hold on a book
  - check out a book
  - add a book
  - remove a book

10 × .5 per name

(.5) name

(b) Scenario: Locating and Borrowing a Book

(.5 assumption) Assume borrower has logged on to a terminal

1. Borrower Enters A = < Shakespeare >
2. Borrower Receives 'Hamlet', 'King Lear'
3. (5) Borrower Gets 'Hamlet' and takes to the librarian
4. Librarian checks book out by entering C, scanning borrower code and book code
5. Librarian checks if book is on hold for another reader. It is NOT on hold
6. Librarian issues book to borrower
7. Borrower takes book home

(-.5) if specific values are not used

(-5) if borrower (or) librarian is overlooked

(-1) if "possible" results listed

(+1) for 1st 5 correct steps

4 take off penalties

(3) (c) source 4

2 × 1.5

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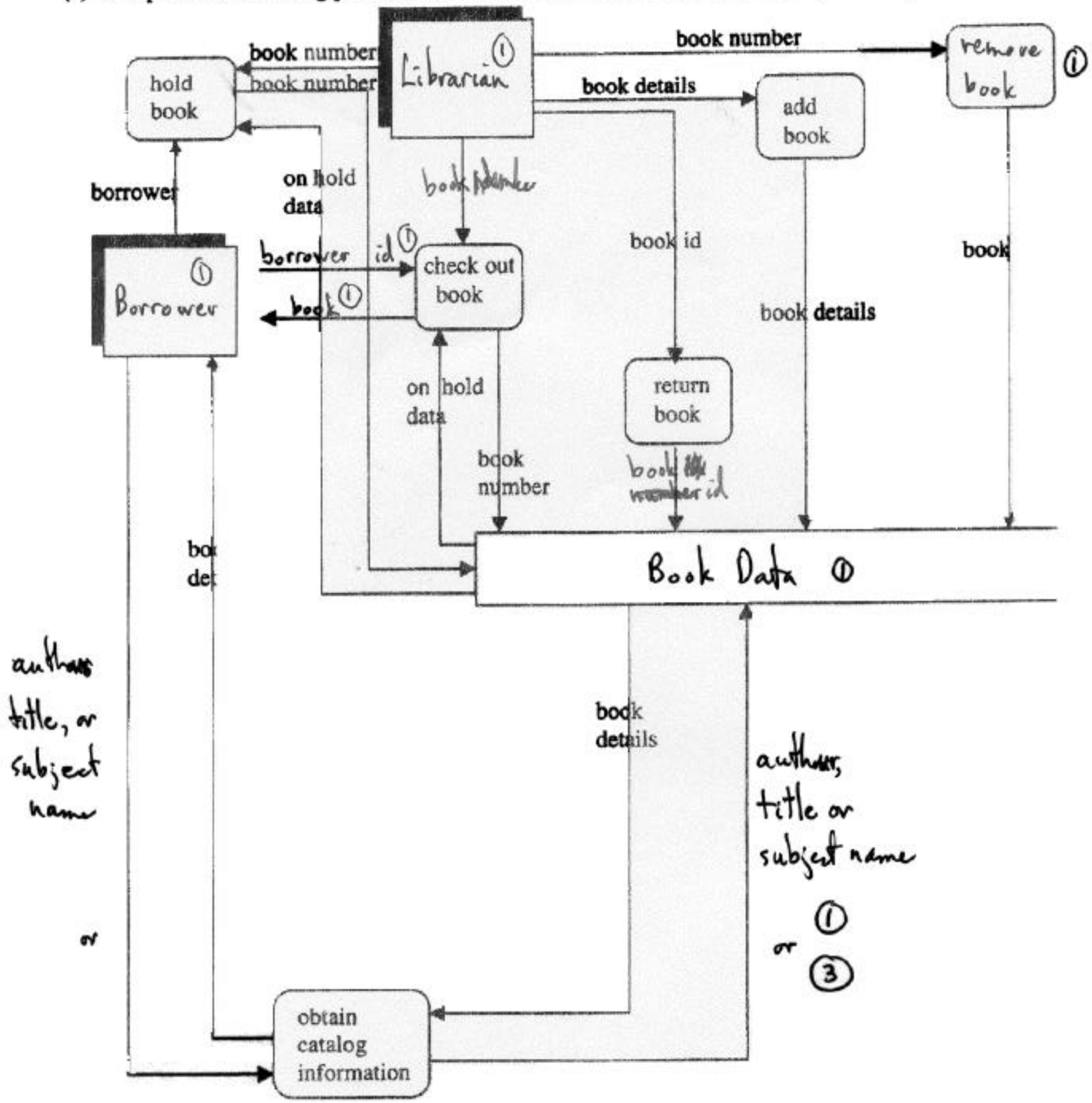
(2) (d) data stored — library book records (name, author, subject, whether on hold, whom on hold for) or library collection

(2) if — member list and id numbers (optional — not discussed in question)

× 1

(e) Complete the following partial Data Flow Diagram for the library system: (10 marks)



Data flow diagram for library circulation

Question 4. [25 marks]

A library system may also be described by capturing the state changes for a single book in the system. Thus, for example, a new book is added to the library system, provided that it does not already exist in multiple copies. This event is called '+'. The book then stays on the shelves in the library until it is removed from circulation ('-' event), or until it is chosen for borrowing ('C' event). If a book is chosen for borrowing and it is on the shelves, then it can be borrowed ('B' event) and removed temporarily from the library. If it is chosen, and it is not on the shelves, then it can be requested ('RH') to be held. If it is not yet on hold, the book is placed on Hold (event 'H'). A book which has been borrowed may be returned ('R'). If it is returned, and it is on Hold for a particular library member ('member'), it is held in 'hold-available' state, waiting for that member to borrow it. If a book is in hold-available state and that member wishes, it can be borrowed ('B') by that member. If a book in hold-available state is not borrowed for 7 days, it is returned to the shelves.

(5)

(a) List the states of the book. (5 marks)

already given on next page

(1) New Book (1) Removed Book

(1) In Library Book (On Shelves) (1) Checked Out (Borrowed) (1) Chosen for Borrowing

(1) On Hold (1) Hold-Available (1) Hold Requested

any 5 of 6

(b) List the events or requests which may cause the book's state to change. (5 marks)

(5) +, -, C, B, RH, H, R, ~~to~~ (time-out after 7 days)

8 x .5 + 1 if they are all present

(c) Give any guards (conditions) which may affect whether or not the book can change state when a particular event occurs. (5 marks)

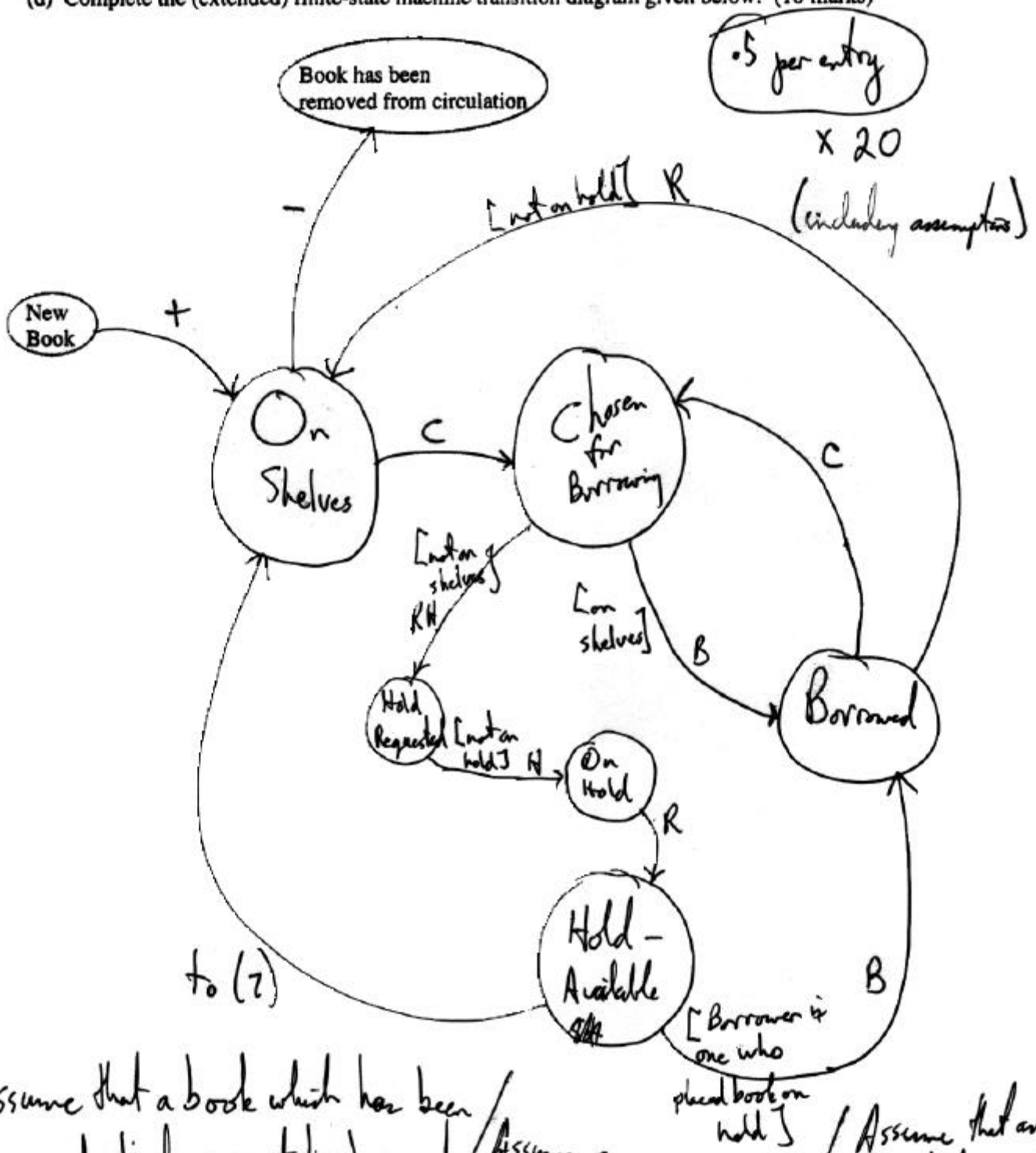
(5) [book not on hold] [book on hold]

[book not on shelves] [book on shelves]

[borrower is one who put book on hold]

5 x (1)

(d) Complete the (extended) finite-state machine transition diagram given below: (10 marks)



Assume that a book which has been borrowed already, cannot be borrowed again until it is returned.

Assume a removed book cannot even be "chosen" for borrowing

Assume that any events which are NOT shown above have no effect on the state

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5. (a) Project is Embedded Type. (1)

/3 Because it has high reliability, performance and security requirements (any 2 of them 3) (2)

(b) Estimated effort is $E = a * 32^b$ (embedded → a = 3.6, b 1.20)

/1 $3.6 * 32^{1.2}$ 230.4 or 231 person-months (2) (1)

if only 230.4 (one mark)

/2 (c) Construct Cost Model (3) : ie cocomo only (.5)

/3 (d) OLP estimate $(50{,}000 + 4*64{,}000 + 90{,}000)/6$ 66,000 LOC (2) (1)

(e) i) Average $\left(1.90 + \frac{735}{72} + \frac{122}{17} + \frac{380}{42} + \frac{184}{23}\right)/5$

/4 $7.6 + 10.2 + 7.18 + 9.05 + 8)/5$ 8.406 person mths./KLOC (3) (1)

ii) Effort 8.406×32 268.992 (only 1 unless truncated upwards) 269 person months (1.5) (.5)

/2

(f) /4 i) The adjustment is calculated by:

(2) 1. Choosing an appropriate rating for each cost driver based on the characteristics of the product, computer, personnel, and project.

(1) 2. Multiply the coefficients together from 1. to get the Effort Adjustment Factor (EAF)

(1) 3. Multiply the nominal effort by EAF to give the estimated development effort

/4 ii) 1. Based on the product description, reliability, complexity, execution time, virtual machine volatility (because of networking), turnaround time requirements are high. Choose highest rating values

(2) Because we don't know personnel and project attributes, the corresponding ratings are all set to nominal (1.00).

(some reasoning must be present)

(.5) 2. EAF = $1.4 * 1.65 * 1.66 * 1.3 * 1.15 * = 5.73$

(1.5) 3. Estimated development effort =

$5.73 * 231 = 1324.26 = 1325$ person months

(1) (.5)

(.5) if only a fraction