

Name: _____

This exam is open book, open notes, but there can be no sharing of any material. You can use the Internet, but only as a library. If you are not sure if something is allowed, check with me. Some questions are marked with a \star . The points for the non- \star questions sum to 60, while those for the \star questions sum to 30.

COS 480 students must answer all questions that are not marked with a \star . The points for each question are indicated in parentheses next to the question number. Questions marked with a \star may also be answered, for extra credit.

COS 580 students must answer all questions, including those marked with a \star . Each question is worth $2/3$ times the points indicated in parentheses.

Several questions on this exam use the database instance suggested below. A row in the **PTides** table represents a predicted tide and lists the location, time, kind (high or low), and height of the prediction. A row in the **DockSched** table represents a scheduled arrival of a boat at a dock and lists the harbor, boat’s name, pilot’s name, scheduled arrival time, and boat’s length. Your answers to questions that ask for queries should work for all instances of databases conforming to the given schema, not only the one depicted below.

These tables are repeated on the last page of the test. (You may detach that page and use it for reference. There is no need to reattach it.)

PTides

location varchar(20)	ptime timestamp	kind char(1)	height float
Blue Hill	2005-10-13 01:27	L	0.29
Blue Hill	2005-10-13 07:42	H	9.80
Blue Hill	2005-10-13 13:47	L	1.00
Blue Hill	2005-10-13 19:59	H	10.98
Eastport	2005-10-13 01:25	L	0.77
Eastport	2005-10-13 07:31	H	17.60

DockSched

harbor varchar(20)	boat varchar(20)	pilot varchar(20)	dtime timestamp	blength integer
Blue Hill	Why Knot	Knotting	2005-10-13 08:00	14
Blue Hill	Why Knot	Knotting	2005-10-14 08:00	14
Blue Hill	Phair Game	Phair	2005-10-13 08:10	10
Castine	Phair Game	Phair	2005-10-13 08:30	10

For notational convenience in relational algebra, we shall refer to the **PTides**(location, ptime, kind, height) and **DockSched**(harbor, boat, pilot, dtime, blength) relations as $P(L, P, K, H)$ and $D(H, B, P, D, L)$, respectively.