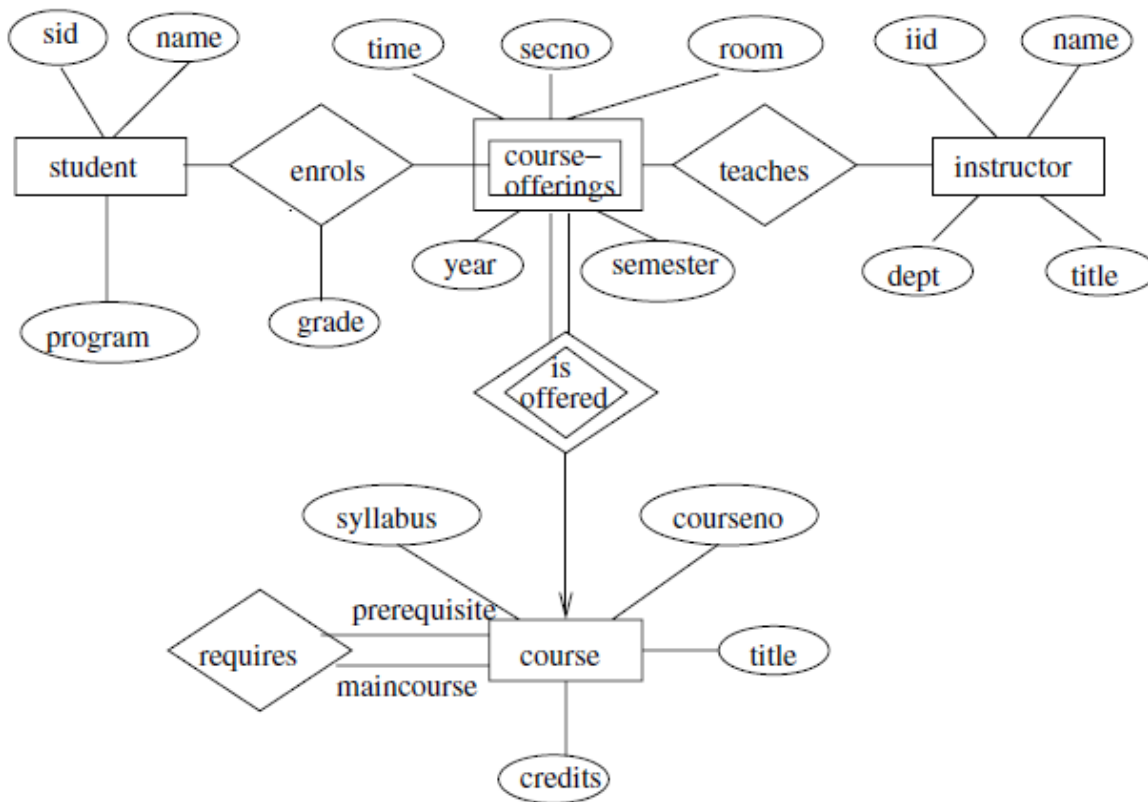


CS30202: Database Management Systems
Class Test I
Marks: 20 - Time: 1 hour

1. Academic section maintains data about the following entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including roll, name, and degree; and (d) instructors, including employee-number, name, department, and designation. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled. *Construct an ER diagram for the academic section. Include mapping, and participating constraints.* **[10]**



OTHER SOLUTIONS ARE VALID

2. Consider a relation $R(A, B)$ that contains r tuples, and a relation $S(B, C)$ that contains s tuples; $r, s > 0$. For each of the following relational algebra expressions, state in terms of r and s the minimum and maximum number of tuples that could be in the result of the expression. Make no assumptions about keys. **[10]**

	<i>Min</i>	<i>Max</i>
a. $R \cup \rho_{S(A,B)} S$	$\max(r, s)$	$r + s$
b. $\pi_{A,C}(R \bowtie S)$	0	$r \times s$
c. $\pi_B R - (\pi_B R - \pi_B S)$	0	$\min(r, s)$
d. $(R \bowtie R) \bowtie R$	r	r
e. $\sigma_{A > B} R \cup \sigma_{A < B} R$	0	r

— ROUGH WORK —

Explanation for Q2:

- a. Minimum = $\max(r, s)$ (if one relation is a subset of the other)
Maximum = $r + s$ (if the relations are disjoint)
- b. Minimum = 0 (if there are no shared B values)
Maximum = $r \times s$ (if all of the B values are the same)
- c. Minimum = 0 (if there are no shared B values)
Maximum = $\min(r, s)$ (if one relation's B values are a subset of the other's, and all B values are distinct)
- d. (equivalent to R)
Minimum = r , Maximum = r
- e. Minimum = 0 (if $A = B$ in all tuples of R)
Maximum = r (if $A \neq B$ in all tuples of R)