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**Ispit iz predmeta IT350 – Baze podataka**

**30.01.2020.**

*Ispit traje 180 minuta*

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| --- | --- | --- | --- | --- | --- |
| *Ime i prezime* | *Broj indeksa* | *Teorijski deo* | *Zadatak 1* | *Zadatak 2* | *Ukupno* |
|  |  |  |  |  |  |

***Napomene:***

1. Da bi se ispit položio, neophodno je osvojiti minimalno ***10 poena*** na zadacima i minimalno ***5 poena*** na teorijskim pitanjima.
2. Za vreme ispita nije dozvoljeno korišćenje mobilnih telefona ili drugih komunikacionih uređaja, kao ni Interneta.
3. Za izradu konceptualnog modela koristiti *PowerDesigner*.
4. DDL naredbe iz zadatka 1 i upite iz zadatka 2 sačuvati kao .sql fajl.
5. Sve fajlove imenujete na sledeći način: IT350-JanuarA-2020-BrInd-ImePrezime-RedniBrojZadatka. Npr. *IT350-JanuarA-2020-1234-VeljkoGrkovic-Zad1*Fajlove smeštate u folder sa nazivom ***IT350-JanuarA-2020-BrInd-ImePrezime***, a pre predaje radova folder arhivirati. **Nepravilno imenovani radovi neće biti pregledani.**
6. Po završetku, javite se dežurnom profesoru/asistentu koji će od vas preuzeti vaš rad.   
   **Slanje radova mail-om nije dozvoljeno.**

***Zadaci i pitanja:***

1. **Teorijska pitanja (10 poena):** Odgovoriti na sledeća pitanja.
   1. **(4 poena)** Relacija na slici 1. pokazuje da autor za svaku prodatu knjigu od svojih izdavača dobija određeni honorar. Iznos honorara zavisi od autora, knjige, i izdanja knjige. Primarni ključ relacije čine ISBN i AutorKnjigeID.   
      Normalizujte ovu relaciju tako da dobijete model baze podataka u 3NF i predstavite je E/R dijagramom. Na dijagramu označite identifikatore tipova entiteta.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ISBN | NazivKnjige | AutorKnjigeID | AutorKnjigeIme | Izdavač | Honorar | Izdanje |
| 1 | Koreni | 1 | Dobrica Ćosić | Prosveta | 15.000 | 1 |
| 1 | Koreni | 1 | Dobrica Ćosić | Nolit | 12.000 | 2 |
| 2 | Pesme za decu | 2 | Dobrica Erić | Prosveta | 10.000 | 1 |
| 2 | Pesme za decu | 2 | Dobrica Erić | Službeni glasnik | 11.000 | 2 |
| 2 | Pesme za decu | 2 | Dobrica Erić | Nolit | 9.000 | 3 |
| 3 | Na Drini ćuprija | 3 | Ivo Andrić | Prosveta | 10.000 | 1 |
| 3 | Na Drini ćuprija | 3 | Ivo Andrić | Službeni glasnik | 8.000 | 2 |

Slika 1: Ne-normalizovan oblik relacije o knjigama i njihovim autorima

* 1. **(3 poena)** Na slici 2. je data familija kolona sa orijentacijom na redove koja sadrži podatke o izvođačima moderne muzike.   
     Podatke sadržane u ovoj familiji kolona predstavite u JSON formatu pod pretpostavkom da je ime izvođača ključ svakog reda u familiji kolona.

A screenshot of a video game

Description automatically generated

Slika 2: Familija kolona sa orijentacijom na redove o izvođačima moderne muzike

* 1. **(3 poena)** Navedite jedan primer izgubljenog ažuriranja nad bazom podatka i objasnite kada se ono može dogoditi.

1. **Zadatak 1 (10 poena):** Rešiti zadatak prema sledećem scenariju korišćenja Web aplikacije za nalaženje posla preko interneta:
   1. Svaka kompanija poslodavca koja želi da nekog zaposli ima mogućnost da napravi svoj profil (naziv kompanije, sedište kompanije, broj telefona, osnovne informacije o kompaniji) i da postavi poslove, sa opisima, na kojima želi da nekoga zaposli (tipove poslova bira iz liste dozvoljenih poslova).
   2. Svaki kandidat koji želi da nađe posao takođe ima svoj profil preko kojeg može ostaviti osnovne podatke o sebi (ime, prezime, godina rođenja, adresa i mesto stanovanja), kao i svoj CV.
   3. Prilikom prijavljivanja na posao, kandidat pregledava listu poslova koju su postavili poslodavci i bira poslove na koje želi da konkuriše, pri čemu unosi i iznos plate koju bi želeo da dobije za taj posao.
   4. Poslodavac može da vidi sve kandidate koji su se prijavili za određeni posao i da im preko aplikacije ili zakaže intervju u sedištu kompanije ili da ih obavesti da ne ispunjavaju uslove iz opisa posla.

Model baze podataka za ovu Web aplikaciju predstavite E/R dijagramom.

1. **Zadatak 2 (10 poena):** Na osnovu fizičkog modela baze podataka (model avio-kompanije), datog na slici 2., generisane su skripte za kreiranje baze podataka i unos test podataka. Izvršite priložene skripte i nad generisanom bazom izvršite sledeće upite:  
   1. (1 poena) U tabeli ***stats*** promeniti tip podatka za trenutnu cenu iz *int* u *float,* vodeći računa da podatak u polju ne sme biti NULL;  
        
      ALTER TABLE `Stats` MODIFY COLUMN `CurrPrice` FLOAT(11) NOT NULL;
   2. (1,5 poena) Prikazati koliko aviona poseduje avio-kompanija, za svaki tip aviona. Ukoliko avio-kompanija ne poseduje avion nekog od tipova aviona, treba prikazati 0.  
        
      [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `aircrafttype`.`AircraftTypeID`, [COUNT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/group-by-functions.html#function_count)(`aircraft`.`AircraftTypeID`) FROM `aircraft` [RIGHT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/string-functions.html#function_right) JOIN `aircrafttype` ON `aircrafttype`.`AircraftTypeID` = `aircraft`.`AircraftTypeID` GROUP BY `aircrafttype`.`AircraftTypeID`
   3. (1,5 poena) Napisati upit koji će prikazati redni broj dana u nedelji (ili dan nedelji) i broj letova u tom danu, pod uslovom da je broj letova veći od nedeljnog proseka letova.  
        
      [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) \* FROM ([SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `DepDay`, [COUNT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/group-by-functions.html#function_count)(`DepDay`) AS `broj\_letova\_u\_tom\_danu` FROM `flightdep` GROUP BY `DepDay`) `tmp1` WHERE `broj\_letova\_u\_tom\_danu` > ( [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) [AVG](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/group-by-functions.html#function_avg)(`broj\_letova\_u\_tom\_danu`) FROM ([SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `DepDay`, [COUNT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/group-by-functions.html#function_count)(`DepDay`) AS `broj\_letova\_u\_tom\_danu` FROM `flightdep` GROUP BY `DepDay`) `temp` )
   4. (2 poena) Prikazati listu ID-jeva letova (routeID) **sa** (fromAirport) i letova **ka** (toAirport) aerodromu *Changi*. Za rešavanje koristiti isključivo podupite.  
        
      [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `RouteID` FROM `Route` WHERE `FromAirport` = ( [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `Airport`.`AirportID` FROM `Airport` WHERE `Airport`.`AirportName` [LIKE](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/string-comparison-functions.html#operator_like) '%Changi%' ) [OR](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_or) `ToAirport` = ( [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `Airport`.`AirportID` FROM `Airport` WHERE `Airport`.`AirportName` [LIKE](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/string-comparison-functions.html#operator_like) '%Changi%' )
   5. (4 poena) Naći sve aktivne rute (WHERE `Status` = 1), kodove i nazive aerodroma sa kojih avioni polaze i na koje pristižu, kao i razdaljinu između gradovima, (WHERE...) za sve parove gradova kod kojih se može uzeti direktna povratna karta, tj. otići i vratiti u isti grad se bez presedanja. Rezultate urediti rastući po razdaljini.  
        
      RESENJE:  
      [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `RouteID`, `Airport`.`AirportID`, `Airport`.`AirportCode`, `Airport`.`AirportName`, `Airport`.`CityName`, `FromAirport`, `ToAirport`,`Distance` FROM `Route` JOIN `Airport` ON `Airport`.`AirportID` = `Route`.`FromAirport` WHERE `Route`.`Status` = 1 [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `FromAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.fromAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport)) [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `ToAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.toAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport))  
        
      UNIJA:  
      [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `FromAirport` FROM ( [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) \* FROM `route` WHERE `status` = 1 [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `FromAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.fromAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport)) [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `ToAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.toAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport)) ORDER BY `distance` ASC) `tmp` UNION [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) `toAirport` FROM ( [SELECT](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) \* FROM `route` WHERE `status` = 1 [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `FromAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.fromAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport)) [AND](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) `ToAirport` [IN](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/comparison-operators.html#function_in) ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) t1.toAirport from `route` t1 where t1.fromAirport < t1.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) exists ([select](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/select.html) 1 from `route` t2 where t1.fromAirport = t2.toAirport [and](http://localhost/phpmyadmin/url.php?url=https://dev.mysql.com/doc/refman/5.5/en/logical-operators.html#operator_and) t1.toAirport = t2.fromAirport)) ORDER BY `distance` ASC) `tmp1`  
        
        
        
      KOMBINACIJA ZA NALAZENJE PAROVA:  
        
      select t1.fromAirport, t1.toAirport

from `route` t1

where t1.fromAirport < t1.toAirport

and exists (select 1 from `route` t2

where t1.fromAirport = t2.toAirport

and t1.toAirport = t2.fromAirport)

SELECT `Route`.`RouteID`, `AIRPORT`.`AirportID`,`AIRPORT`.`AirportCode`,`airport`.`AirportName`,`airport`.`CityName`,`route`.`Distance`,`route`.`Duration`,`route`.`Status`

FROM `route`

JOIN `airport`

ON `airport`.`AirportID` = `route`.`TOAirport`

WHERE `ROUTE`.`Status` = 1 AND `TOAirport` IN

(select t1.TOAirport from `route` t1 where t1.fromAirport < t1.toAirport and exists

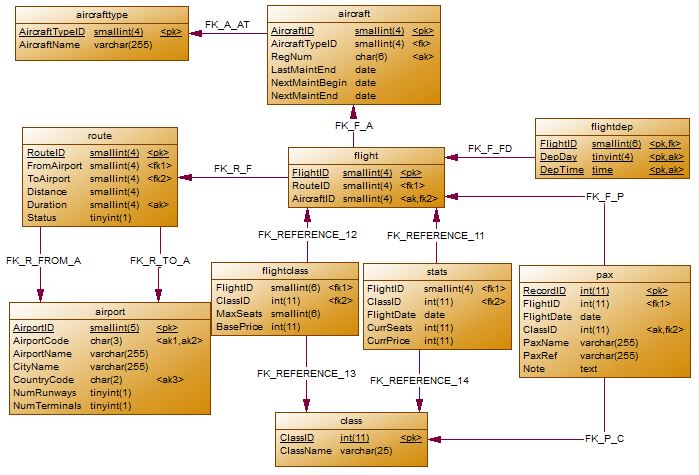
(select 1 from `route` t2 where t1.fromAirport = t2.toAirport and t1.toAirport = t2.fromAirport))

AND `ToAirport` IN

(select t1.toAirport from `route` t1 where t1.fromAirport < t1.toAirport and exists

(select 1 from `route` t2 where t1.fromAirport = t2.toAirport and t1.toAirport = t2.fromAirport))

ORDER BY `distance` ASC;



Slika 2. – Fiziki model baze podataka