Question 1

a)Calculate the Tenure (the time they were/ are employed) in years for each employee.

In order to calculate the tenure of each employee in my spreadsheet. I added a new column called 'Tenure'. In this column I used the DATEDIF function to subtract the start date of employment from the end date of employment for each employee, ensuring the result was formatted in years by using the "Y" . This formula was copied down the entire column to calculate tenure for all employees. If the employee is still with the company, I used the TODAY() function as the end date.

fx =DATEDIF($I2,$N2,"Y")

b)How much would the total bonus payout be if employees with more than 10 years of tenure received a 2% bonus increase?

To determine the total bonus payout considering a 2% bonus increase for employees with more than 10 years of tenure, I first added a new column called 'Increased Bonus %' to the 'Employee Data' spreadsheet. In this column, I used an IF formula that applied a 2% increase for employees with tenures of 10 years or more. The formula used was

fx =IF($O2>=10,"2%","0%") , which places a 2% increase if the tenure condition is met, or 0% otherwise.

Next, I created a column named 'Total Bonus Payout with Increased Bonus' where I calculated the total bonus payout for each employee. This involved adjusting their current bonus based on the new bonus percentage and then multiplying by their annual salary to get their individual bonus payout. Then to find the total of the bonus payouts with the increased bonus, I used the SUM function to add up all individual payouts in the 'Total Bonus Payout with Increased Bonus' column. This provided the total bonus payout for the entire set of employees, including the 2% increase for those with tenures over 10 years."

c)What is the total annual salary expense for the IT department employees?
 23,567,499

To calculate the total annual salary expense for the IT department, I started by applying a filter to the department column in my spreadsheet to display only the employees in the IT department. Next, I used the SUM function to add up the values in the annual salary column for all IT department employees. I ensured that the range selected for the SUM function only included the salaries of employees who were listed as part of the IT department. Once I had the sum, I checked the value to confirm it was correct. The total annual salary expense calculated for the IT department employees was $23,567,499."

d) To populate the new 'Adjusted Salaries' column with updated annual salary values, I first make a new column adding adjusted salaries. Then, I used an IF formula that applies a 10%

increase to salaries below $50,000 and a 5% increase to salaries above $100,000. This formula looks at each employee's current salary adjujests it given the conditions i put in. The specific formula used in the 'Adjusted Salaries' column

fx =IF($J2<50000,$J2*1.1,IF($J2>100000,$J2*1.05,$J2))

After entering the formula for the first employee in the column, I copied it down to apply to all employees, ensuring each salary was adjusted correctly.Finally, I made sure to format the 'Adjusted Salaries' column as currency, so the new salary values are displayed in a clear and consistent monetary format."

E)"To find the average age of employees who are eligible for a bonus higher than 5% and are located in China, I used the AVERAGEIFS function. The average range was set to the cells H2 through H1001, which contain the age. I then set two conditions: one for the bonus percentage to be greater than 5%, referencing cells K2 through K1001, and another for the country of work to be China, referencing cells L2 through L1001. The function I used is =AVERAGEIFS(H2:H1001, K2:K1001, ">0.05", L2:L1001, "China"), which gave me the average age for an employee is 45.

fx =AVERAGEIF($H$2:$H$1001,$K$2:$K$1001,">0.05",$L$2:$L$1001, "China")

The average age for an employee is 45.

f)How do employees' average age and tenure vary across departments and genders?

male employees generally have a higher average age and tenure across most departments compared to female employees. The IT department has the highest average tenure for both genders, while the Engineering department has the highest average age for males, and the Finance department has the highest average age for females.

To generate the pivot table, I assigned "Department" to Rows, "Gender" to Columns and "Age" and "Tenure" to Values. As shown below.

	Gender	Values					
	Female		Male		Grand Total	
Department	AVERAGE of Age	AVERAGE of tenure	AVERAGE of Age	AVERAGE of tenure	AVERAGE of Age	AVERAGE of tenure
Accounting	43.94	9.77	43.30	9.37	43.66	9.59
Engineering	43.76	10.16	47.63	12.41	45.67	11.27
Finance	44.45	10.41	46.43	11.73	45.29	10.97
Human Resources	45.14	10.59	43.74	11.31	44.46	10.94
IT	44.99	11.02	43.71	11.65	44.34	11.34
Marketing	42.96	9.95	43.44	10.06	43.22	10.01
Sales	44.04	11.25	43.17	11.11	43.64	11.19
Grand Total	44.28	10.54	44.49	11.26	44.38	10.89

Values as: Columns ▾ .dd

Rows   Add

Columns   Add

Age   ×
Summarise by   Show as
AVERA... ▾   Default ▾

Department   ×
Order   Sort by
Ascen... ▾   Depart... ▾
☑ Show totals

Gender   ×
Order   Sort by
Ascen... ▾   Gender ▾
☑ Show totals

tenure   ×
Summarise by   Show as
AVERA... ▾   Default ▾

g)How many employees of each ethnicity work in the "Manufacturing" Business Unit within the United States, and what is their average annual salary?

Ethnicity	AVERAGE of Annual Salary	COUNTA of EEID
Asian	£114,967	50
Black	£86,756	24
Caucasian	£102,644	75
Latino	£101,963	30
Grand Total	£103,842	179

Filters   Add

Values as: Columns ▾ .dd

Rows   Add

Annual Salary   ×
Summarise by   Show as
AVERA... ▾   Default ▾

Business Unit   ×
Status
Showing 1 item   ▾

Ethnicity   ×
Order   Sort by
Ascen... ▾   Ethnici... ▾
☑ Show totals

EEID   ×
Summarise by   Show as
COUN... ▾   Default ▾

Country   ×
Status
Showing 1 item   ▾

To generate the pivot table, I assigned "ethnicity" to Rows, "Annual Salary" and "EEID" to Values and for filters ii assigned "Business Unit" ticking only the manufacturing unit and "Country" only ticking United States as the country as shown above. Giving me the results of 50 Asian Employee work in the manufacturing unit getting an average annual salary of £114,967. There are 24 black employees getting an average annual salary of £86,756, 75 Caucasian employees getting £102,644 and 30 latino employees getting £101,963. In total there are 179 employees working in the manufacturing business unit within the united states getting an average annual salary of £103,842.

h)For employees hired after 2020, which country has the highest average tenure for Males and Females?

To generate this pivot table, I assigned "country" to Rows, "Gender" to columns "Tenure" to Values and for filters I assigned "Hire Date" ticking only dates after where employees are hired after 2020. This gave this pivot table below and their for both females and males, brazil has the highest average tenure.

AVERAGE of tenure	Gender		
Country	Female	Male	Grand Total
Brazil	2.50	2.75	2.58
China	2.25	2.17	2.23
United States	2.22	2.12	2.17
Grand Total	2.27	2.20	2.24

Rows — Add

Country ✕
Order: Ascen... ▾   Sort by: Country ▾
☑ Show totals

Columns — Add

Gender ✕
Order: Ascen... ▾   Sort by: Gender ▾
☑ Show totals

Values — Add

tenure ✕
Summarise by: AVERA... ▾   Show as: Default ▾

Filters — Add

Hire Date ✕
Status: Showing 76 items ▾

i)Consider the employees in the IT and Engineering departments categorised into age groups: under 30,30 - 39, 40- 49, 50 - 59, and 60 and over years old.

To generate this pivot table, I assigned "Age" to Rows and grouped them by creating a pivot group. I categorised employees in the IT and Engineering age group of **under 30,30 - 39, 40- 49, 50 - 59, and 60 and over years old.** I also assigned "Department" to columns, "Annual salary" and " Total Bonus Payout With Increased Bonus" to Values summarising them by SUM and for filters I assigned "department" ticking only employees from the IT and Engineering Department. This gave this pivot table below and the results below.

SUM of Total Bonus Payout With Increa:	Department			
Grouped Age	Age	Engineering	IT	Grand Total
⊞ 30 Total		266%	309%	575%
⊞ 40 Total		416%	420%	836%
⊞ 50 Total		314%	551%	865%
⊞ 60 Total		225%	112%	337%
⊞ 25, 26, 27, ... Total		57%	169%	226%
Grand Total		1278%	1561%	2839%

Rows — Add

Grouped Age ✕
Order: Ascen... ▾   Sort by: Groupe... ▾
☑ Show totals
☐ Repeat row labels

Age ✕
Order: Ascen... ▾   Sort by: Age ▾
☑ Show totals

Values as: Columns ▾ .dd

Annual Salary ✕
Summarise by: SUM ▾   Show as: Default ▾

Total Bonus Payout W ✕
Summarise by: SUM ▾   Show as: Default ▾

Columns — Add

Department ✕
Order: Ascen... ▾   Sort by: Depart... ▾
☑ Show totals

Filters — Add

Department ✕
Status: Showing 2 items ▾

30-39:

Sum of annulary salary: £8,900,575
SUM of Total Bonus Payout With Increased Bonus: 575%

Under 30:
Sum of annulary salary:**£4,431,831**
SUM of Total Bonus Payout With Increased Bonus:**226%**

30-39
Sum of annulary salary:**£8,900,575**
SUM of Total Bonus Payout With Increased Bonus:**575%**

40-49:
Sum of annulary salary: **£12,173,258**
SUM of Total Bonus Payout With Increased Bonus: **836%**
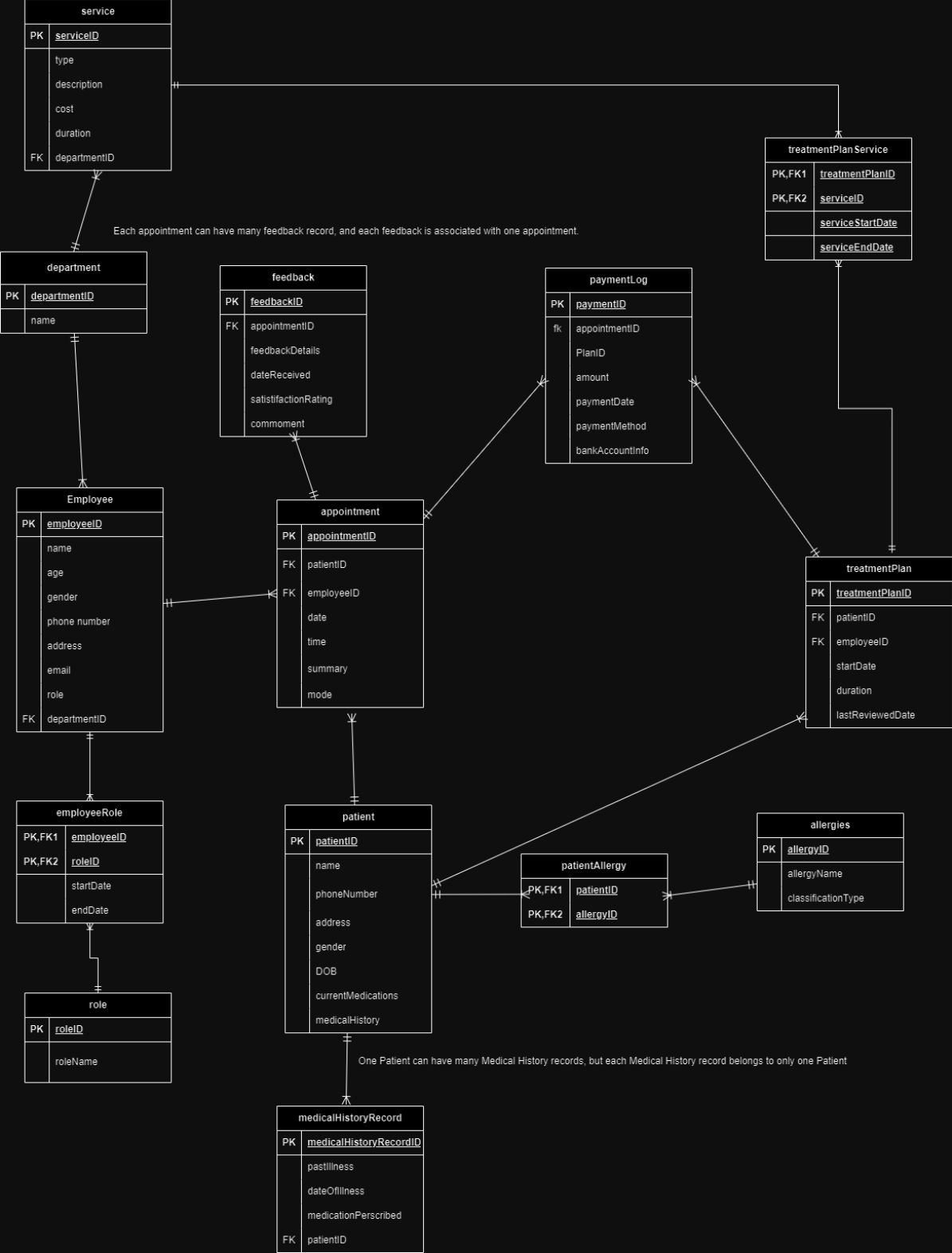**50 - 59:**
Sum of annulary salary:**£11,333,267**
SUM of Total Bonus Payout With Increased Bonus: **865%**

Above 60:
Sum of annulary salary:**£3,956,131**
SUM of Total Bonus Payout With Increased Bonus:**337%**

Spreadsheet

Question 2:

service

PK	serviceID
	type
	description
	cost
	duration
FK	departmentID

treatmentPlanService

PK,FK1	treatmentPlanID
PK,FK2	serviceID
	serviceStartDate
	serviceEndDate

department

PK	departmentID
	name

feedback

PK	feedbackID
FK	appointmentID
	feedbackDetails
	dateReceived
	satistifactionRating
	commoment

Each appointment can have many feedback record, and each feedback is associated with one appointment.

paymentLog

PK	paymentID
fk	appointmentID
	PlanID
	amount
	paymentDate
	paymentMethod
	bankAccountInfo

Employee

PK	employeeID
	name
	age
	gender
	phone number
	address
	email
	role
FK	departmentID

appointment

PK	appointmentID
FK	patientID
FK	employeeID
	date
	time
	summary
	mode

treatmentPlan

PK	treatmentPlanID
FK	patientID
FK	employeeID
	startDate
	duration
	lastReviewedDate

employeeRole

PK,FK1	employeeID
PK,FK2	roleID
	startDate
	endDate

patient

PK	patientID
	name
	phoneNumber
	address
	gender
	DOB
	currentMedications
	medicalHistory

patientAllergy

PK,FK1	patientID
PK,FK2	allergyID

allergies

PK	allergyID
	allergyName
	classificationType

role

PK	roleID
	roleName

One Patient can have many Medical History records, but each Medical History record belongs to only one Patient

medicalHistoryRecord

PK	medicalHistoryRecordID
	pastIllness
	dateOfIllness
	medicationPerscribed
FK	patientID

how AI and IoT are transforming the healthcare industry.

Introduction:

In today's world, healthcare is changing faster than ever before,adapting to the latest technological innovations. We can now see a shift towards more advanced technology to make healthcare better,more personalised, and more efficient.This shift is being led by technology trends such as Artificial Intelligence(AI) and Internet of Things (Iot), which are trends set to redefine what is possible in patient care,diagnosis,treatment and overall health management. This essay will take a closer look at how technology trends such as AI and Iot are taking the healthcare industry into a new innovative era.

AI

AI is used in the healthcare industry for multiple things such as communicating with the patients, helping assist surgeries and creating new pharmaceuticals. It has been said that "Some healthcare organisations have also experimented with chatbots for patient interaction, mental health and wellness, and telehealth"[2]. Alongside all these uses, AI in the healthcare industry helps reduce a lot of work time by doing things such as predicting 3D structures of proteins from amino acid sequences, which is a very difficult and time-consuming task. There's a few AI technologies that can do this, such as AlphaFold 2, which is developed by DeepMind, a technology company that has managed to achieve this difficult task with level of accuracy. It's said that the "The latest version of AlphaFold predicts protein structures using a machine learning approach that incorporates physical and biological knowledge about protein structure, leveraging multi-sequence alignments, into the design of the deep learning algorithm"[1].AI is also being using to predict the location of potential cancer cells more quickly than WSI scans as "AI can process WSI using computer vision and convolutional neural networks"[1]. By targeting high need areas like cancer diagnosis and treatment, the advancement of AI in this area is able to help healthcare industries by focusing on data received from AI instead of spending long hours gathering the data. This aligns with Porter's focus strategy. Johns Hopkins medicine is an academic medical centre that has implemented the use of Ai and now uses it for their research and diagnosis. Physician Wolf from Johns Hopkins medicine and her team "were among the first physicians to use LumineticsCore (previously known as IDx-DR), the first FDA-approved AI-enabled diagnostic device, in a paediatric care setting"[3]. Their work was used to reduce the cost of diabetic retinopathy screening, aligning with the cost leadership Porter's Strategy by reducing operational costs. However when considering the implementation of AI in the healthcare industry, they must consider the privacy issue we are being faced with. As they are handling large volumes of data, privacy and security levels become more crucial. However, we can see healthcare industry such as the mayo clinic taking action, as they have partnered with google and "the Mayo-Google partnership illustrates an approach to how health systems and technology companies can partner to facilitate knowledge generation while addressing privacy and cybersecurity concerns"[5]

IOT

The integration of IOT devices in the healthcare industry is significantly benefiting them into enabling doctors and patients the ability to monitor their health conditions in real-time, through things like wearable technology and IOT tracking systems.We can now use a smartwatch to alert heart rate changes and measure blood vitals as "Optical technology like Photoplethysmography (PPG) can measure variations in blood volume and composition[1]." In addition to that, we can now see hospital's using bio patches and smart heart aids as another wearable device to help track vitals and improve noise isolation of hearing aids. IOT devices aren't just used as wearable devices in the healthcare industry, but can also be used to keep track of hospital's medical equipment and track patient activities using smart beds that detect their movements. The healthcare industry does this stuff through things like "IntelliVue Guardian solution, which employs wearable biosensors and IoT connectivity to continuously monitor patients' vital signs" [1]. Furthermore, by offering these innovative technologies, healthcare providers can differentiate themselves from competitors as their innovations would appeal to patients that are looking for more tech-savvy medical service's which is a strategy that ties into Porter's differentiation strategy, and also enhancing a healthcare provider's competitiveness.The healthcare industry can also focus on certain groups and target specific needs with these IOT devices, such as making wearable smartwatch that can monitor glucose level for diabetics. This aligns with Porter's focus strategy, as it is a strategy that can be marketed to patients with specific needs such as patients with diabetes. One of the world's leading biopharmaceutical companies, pfizer, has used IOT devices during covid as a way to keep track of medicine temperatures. It's been said that their "tools ensured cold chain integrity with real-time monitoring of shipments and temperatures anywhere in the world with close to 100 percent accuracy"[4].

In conclusion, the implementation of AI and Iot devices in the healthcare industry has shown to become a more efficient and advantageous way of doing medicine. We have seen how healthcare providers use AI to enhance the diagnostic accuracy of patients and improve treatment outcomes, whilst Iot devices offer them real-time monitoring and personalised patient care. And by offering these unique services, the healthcare providers are set apart from their competitors which supports Porter's Differentiation strategy. As the healthcare industry continues to evolve and continues to meet the demands of a tech-savvy patient population, I think that a lot more hospitals and researchers should look into using technology to effectively help with their practices. This is because I believe that embracing these technologies will help healthcare providers to remain competitive and stay relevant as we are now in a technology-driven world.

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https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6616181/#:~:text=It%20can%20be%20used%20for,management%20and%20medical%20records%20management.&text=Some%20healthcare%20organisations%20have%20also,health%20and%20wellness%2C%20and%20telehealth(accessed 2019 June)

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[4]Pfizer. "Pfizer applies latest digital technology to optimize COVID-19 vaccine development." Pfizer 2021 Annual Report.
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