Programming Projects

1. Ans:

```
# include <stdio.h>
# define NORMAL_DISC 10/100.0
# define SPECIAL_DISC 12/100.0
# define SALES_TAX 5/100.0
# define DISC_BOUNDARY 100.0

int main()
{
   double purchase_amt, taxable_amt, tax_amt, total;
   int teach;
   printf("Enter the total purchase amount=> ");
   scanf("%lf",&purchase_amt);
   printf("Whether purchaser is a teacher or not (1/0)?=> ");
   scanf("%d",&teach);
   printf("Total purchases $%.2f\n",purchase_amt);
   if(teach == 1)
   {
      if(purchase_amt >= DISC_BOUNDARY)
      {
         printf("Teacher's discount (12%%) %.2f\n",purchase_amt*SPECIAL_DISC);
         taxable_amt = purchase_amt-purchase_amt*SPECIAL_DISC;
         printf("Discounted total %.2f\n",taxable_amt);
         tax_amt = taxable_amt*SALES_TAX;
      }
      else
      {
         printf("Teacher's discount (10%%) %.2f\n",purchase_amt*NORMAL_DISC);
         taxable_amt = purchase_amt-purchase_amt*NORMAL_DISC;
         printf("Discounted total %.2f\n",taxable_amt);
         tax_amt = taxable_amt*SALES_TAX;
      }
   }
   else
   {
      taxable_amt = purchase_amt;
      tax_amt = taxable_amt*SALES_TAX;
   }
   printf("Sales tax (5%%) %.2f\n",tax_amt);
   total = taxable_amt + tax_amt;
   printf("Total $%.2f\n",total);
   return 0;
}
```

O/P

Enter the total purchase amount=> 122.0
Whether purchaser is a teacher or not (1/0)?=> 1
Total purchases $122.00
Teacher's discount (12%) 14.64
Discounted total 107.36
Sales tax (5%) 5.37
Total $112.73

Enter the total purchase amount=> 24.90
Whether purchaser is a teacher or not (1/0)?=> 0
Total purchases $24.90
Sales tax (5%) 1.25
Total $26.14

2. Ans:

```
# include <stdio.h>

int main()
{
   double weight, height, BMI;
   printf("Enter the person's weight in pounds=> ");
   scanf("%lf",&weight);
   printf("Enter the person's height in inches=> ");
   scanf("%lf",&height);
   BMI = (703.0*weight)/(height*height);
   if(BMI < 18.5)
   printf("Person is underweight.\n");
   else if(BMI <= 24.9)
   printf("Person is normal.\n");
   else if(BMI <= 29.9)
   printf("Person is overweight.\n");
   else
   printf("Person is obese.\n");
   return 0;
}
```

O/P

Enter the person's weight in pounds=> 144
Enter the person's height in inches=> 68
Person's BMI is 21.9 and Person is normal.

3. Ans:

```
# include <stdio.h>

int main()
{
   double heading;
   printf("Enter the compass headings in degrees (0 to 360)=> ");
   scanf("%lf",&heading);
   if(heading >= 0 && heading < 90)
   printf("The bearing is North %.1f degrees West.\n",heading);
   else if(heading >= 90 && heading < 180)
   printf("The bearing is South %.1f degrees East.\n",180.0 - heading);
   else if(heading >= 180 && heading < 270)
   printf("The bearing is South %.1f degrees West.\n",heading - 180.0);
   else if(heading >= 270 && heading <= 360)
   printf("The bearing is North %.1f degrees East.\n",360.0 - heading);
   else
   printf("Entered heading is out of range.\n");
   return 0;
}
```

O/P

Enter the compass headings in degrees (0 to 360)=> 110.0
The bearing is South 70.0 degrees East.

4. Ans:

```
# include <stdio.h>

int main()
{
   char color;
   printf("Enter the color of the cylinder=> ");
   scanf("%c",&color);
   switch (color)
   {
   case 'O':
   case 'o':
      printf("Contents of the gas cylinder is ammonia.\n");
      break;
   case 'B':
   case 'b':
      printf("Contents of the gas cylinder is carbon monoxide.\n");
      break;
   case 'Y':
   case 'y':
      printf("Contents of the gas cylinder is hydrogen.\n");
      break;
   case 'G':
   case 'g':
      printf("Contents of the gas cylinder is oxygen.\n");
      break;
   default:
      printf("Contents unknown.");
   }
   return 0;
}
```

O/P

Enter the color of the cylinder=> y
Contents of the gas cylinder is hydrogen.

5. Ans:

```
# include <stdio.h>

int main()
{
   double magnitude;
   printf("Enter the magnitude of earthquake on Richter scale number=> ");
   scanf("%lf",&magnitude);
   if(magnitude > 0 && magnitude < 5.0)
   printf("The category of earthquake is little or no damage.\n");
   else if(magnitude >= 5.0 && magnitude < 5.5)
   printf("The category of earthquake is some damage.\n");
   else if(magnitude >= 5.5 && magnitude < 6.5)
   printf("The category of earthquake is serious damage: walls may crack or fall.\n");
   else if(magnitude >= 6.5 && magnitude < 7.5)
```

```
   printf("The category of earthquake is disaster: houses and buildings may collapse.\n");
   else if(magnitude >= 7.5)
   printf("The category of earthquake is Catastrophe: most buildings destroyed.\n");
   else
   printf("Invalid magnitude of earthquake.\n");
   return 0;
}
```

O/P

Enter the magnitude of earthquake on Richter scale number=> 7.5
The category of earthquake is Catastrophe: most buildings destroyed.

6. Ans:

```
# include <stdio.h>

int main()
{
   double x,y;
   printf("Enter the x and y coordinates of a point=> ");
   scanf("%lf %lf",&x,&y);
   if(x > 0 && y > 0)
   printf("(%.1f , %.1f) is in quadrant I.\n",x,y);
   else if(x < 0 && y > 0)
   printf("(%.1f , %.1f) is in quadrant II.\n",x,y);
   else if(x < 0 && y < 0)
   printf("(%.1f , %.1f) is in quadrant III.\n",x,y);
   else if(x > 0 && y < 0)
   printf("(%.1f , %.1f) is in quadrant IV.\n",x,y);
   else if(x == 0)
   printf("(%.1f , %.1f) is on the y-axis.\n",x,y);
   else
   printf("(%.1f , %.1f) is on the x-axis.\n",x,y);
   return 0;
}
```

O/P

Enter the x and y coordinates of a point=> -1.0 -2.5
(-1.0 , -2.5) is in quadrant III.

Enter the x and y coordinates of a point=> 0.0 4.8
(0.0 , 4.8) is on the y-axis.

7. Ans:

```
# include <stdio.h>

int leap (int);

int main()
{
   int day, month, year, day_num;
   printf("Enter the day month and year (dd/mm/yyyy)=> ");
   scanf("%d%d%d",&day,&month,&year);
   if(day < 1 || day > 31 || month < 1 || month > 12 || year < 0)
   printf("Invalid date.\n");
```

```
   else{
   if(month==1)
   day_num = day;
   else if(month==2)
   day_num = 31+day;
   else if(month==3)
   day_num = 31+28+day;
   else if(month==4)
   day_num = 31+28+31+day;
   else if(month==5)
   day_num = 31+28+31+30+day;
   else if(month==6)
   day_num = 31+28+31+30+31+day;
   else if(month==7)
   day_num = 31+28+31+30+31+30+day;
   else if(month==8)
   day_num = 31+28+31+30+31+30+31+day;
   else if(month==9)
   day_num = 31+28+31+30+31+30+31+31+day;
   else if(month==10)
   day_num = 31+28+31+30+31+30+31+31+30+day;
   else if(month==11)
   day_num = 31+28+31+30+31+30+31+31+30+31+day;
   else
   day_num = 31+28+31+30+31+30+31+31+30+31+30+day;
   if(leap(year))
   printf("%d/%d/%d, is day %d.\n",day,month,year,day_num+1);
   else
   printf("%d/%d/%d, is day %d.\n",day,month,year,day_num);}
   return 0;
}

int leap (int year)
{
   if((year % 100) == 0 && (year % 400) == 0)
   return 1;
   else if((year % 100) == 0 && (year % 400) != 0)
   return 0;
   else if((year % 4) == 0)
   return 1;
   else
   return 0;
}
```

O/P

Enter the day month and year (dd/mm/yyyy)=> 01 01 1994
1/1/1994, is day 1.

Enter the day month and year (dd/mm/yyyy)=> 31 12 1993
31/12/1993, is day 365.

Enter the day month and year (dd/mm/yyyy)=> 31 12 1996
31/12/1996, is day 366.

Enter the day month and year (dd/mm/yyyy)=> -2 0 1992
Invalid date.

8. Ans:

```
# include <stdio.h>

int main()
{
   int pol_num, odo_read;
   double num_gram;
   printf("(1) Carbon monoxide\n");
   printf("(2) Hydrocarbons\n");
   printf("(3) Nitrogen oxides\n");
   printf("(4) Nonmethane hydrocarbons\n");
   printf("Enter pollutant number>> ");
   scanf("%d",&pol_num);
   printf("Enter number of grams emitted per mile>> ");
   scanf("%lf",&num_gram);
   printf("Enter odometer reading>> ");
   scanf("%d",&odo_read);
   if(pol_num < 1 || pol_num > 4)
   printf("Invalid pollutant number.\n");
   else{
   if((pol_num == 1) && (odo_read <= 50000) && (num_gram > 3.4))
   printf("Emissions exceed permitted level of 3.4 grams/mile.\n");
   else if((pol_num == 1) && (odo_read > 50000) && (odo_read <= 100000) && (num_gram > 4.2))
   printf("Emissions exceed permitted level of 4.2 grams/mile.\n");
   else if((pol_num == 2) && (odo_read <= 50000) && (num_gram > 0.31))
   printf("Emissions exceed permitted level of 0.31 grams/mile.\n");
   else if((pol_num == 2) && (odo_read > 50000) && (odo_read <= 100000) && (num_gram > 0.39))
   printf("Emissions exceed permitted level of 0.39 grams/mile.\n");
   else if((pol_num == 3) && (odo_read <= 50000) && (num_gram > 0.4))
   printf("Emissions exceed permitted level of 0.4 grams/mile.\n");
   else if((pol_num == 3) && (odo_read > 50000) && (odo_read <= 100000) && (num_gram > 0.5))
   printf("Emissions exceed permitted level of 0.5 grams/mile.\n");
   else if((pol_num == 4) && (odo_read <= 50000) && (num_gram > 0.25))
   printf("Emissions exceed permitted level of 0.25 grams/mile.\n");
   else if((pol_num == 4) && (odo_read > 50000) && (odo_read <= 100000) && (num_gram > 0.31))
   printf("Emissions exceed permitted level of 0.31 grams/mile.\n");
   else
   printf("Emissions is within permitted level.\n");}
   return 0;
}
```

O/P

```
(1) Carbon monoxide
(2) Hydrocarbons
(3) Nitrogen oxides
(4) Nonmethane hydrocarbons

Enter pollutant number>> 2
Enter number of grams emitted per mile>> 0.35
Enter odometer reading>> 40112
Emissions exceed permitted level of 0.31 grams/mile.
```

9. Ans:

```
# include <stdio.h>
# define WEEKDAY_CHG 39.99
# define ADDITIONAL_WEEKDAY_CHG 0.4
```

```
# define TAX 5.25/100

int main()
{
   int weekday_minutes, night_minutes, weekend_minutes;
   double pretax_bill, avg_min_cost;
   printf("Enter the number of weekday minutes>> ");
   scanf("%d",&weekday_minutes);
   printf("Enter the number of night minutes>> ");
   scanf("%d",&night_minutes);
   printf("Enter the number of weekend minutes>> ");
   scanf("%d",&weekend_minutes);
   printf("The number of weekday minutes: %d\n",weekday_minutes);
   printf("The number of night minutes: %d\n",night_minutes);
   printf("The number of weekend minutes: %d\n",weekend_minutes);
   if(weekday_minutes <= 600)
   pretax_bill = WEEKDAY_CHG;
   else
   pretax_bill = WEEKDAY_CHG + (weekday_minutes - 600)*ADDITIONAL_WEEKDAY_CHG;
   avg_min_cost = pretax_bill/(weekday_minutes+night_minutes+weekend_minutes);
   printf("Pretax bill: %.2f\n",pretax_bill);
   printf("Average minute cost: %.2f\n",avg_min_cost);
   printf("Tax: %.2f\n",pretax_bill*TAX);
   printf("Total bill: %.2f\n",(pretax_bill + pretax_bill*TAX));
   return 0;
}
```

O/P

Enter the number of weekday minutes>> 500
Enter the number of night minutes>> 200
Enter the number of weekend minutes>> 400

The number of weekday minutes: 500
The number of night minutes: 200
The number of weekend minutes: 400
Pretax bill: 39.99
Average minute cost: 0.04
Tax: 2.10
Total bill: 42.09

Enter the number of weekday minutes>> 800
Enter the number of night minutes>> 100
Enter the number of weekend minutes>> 900

The number of weekday minutes: 800
The number of night minutes: 100
The number of weekend minutes: 900
Pretax bill: 119.99
Average minute cost: 0.07
Tax: 6.30
Total bill: 126.29

10. Ans:

```
# include <stdio.h>

void white_bread_automatic(double);
void sweet_bread_automatic(double);
```

```
void white_bread_manual(double);
void sweet_bread_manual(double);

int main()
{
   char bread_type;
   int loaf_size, baking;
   printf("Enter the type of bread (w for White and s for Sweet)>> ");
   scanf("%c",&bread_type);
   printf("Enter the loaf size (1 for double and 0 for single)>> ");
   scanf("%d",&loaf_size);
   printf("Enter the baking type (1 for manual and 0 for automatic)>> ");
   scanf("%d",&baking);
   if((bread_type == 'w') && (loaf_size == 0) && (baking == 0))
   white_bread_automatic(1);
   else if((bread_type == 'w') && (loaf_size == 1) && (baking == 0))
   white_bread_automatic(1.5);
   else if((bread_type == 'w') && (loaf_size == 0) && (baking == 1))
   white_bread_manual(1);
   else if((bread_type == 'w') && (loaf_size == 1) && (baking == 1))
   white_bread_manual(1.5);
   else if((bread_type == 's') && (loaf_size == 0) && (baking == 0))
   sweet_bread_automatic(1);
   else if((bread_type == 's') && (loaf_size == 1) && (baking == 0))
   sweet_bread_automatic(1.5);
   else if((bread_type == 's') && (loaf_size == 0) && (baking == 1))
   sweet_bread_manual(1);
   else if((bread_type == 's') && (loaf_size == 1) && (baking == 1))
   sweet_bread_manual(1.5);
   else
   printf("Invalid option\n");
   return 0;
}

void white_bread_automatic(double n)
{
   printf("Primary kneading: %.0f mins\n",15*n);
   printf("Primary rising: %.0f mins\n",60*n);
   printf("Secondary kneading: %.0f mins\n",18*n);
   printf("Secondary rising: %.0f mins\n",20*n);
   printf("Loaf shaping: %.0f seconds\n",2*n);
   printf("Final rising: %.0f mins\n",75*n);
   printf("Baking: %.0f mins\n",45*n);
   printf("Cooling: %.0f mins\n",30*n);
   printf("Total time: %.0f mins and %.0f seconds\n",(15*n + 60*n + 18*n + 20*n + 75*n + 45*n + 30*n),
2*n);
}

void sweet_bread_automatic(double n)
{
   printf("Primary kneading: %.0f mins\n",20*n);
   printf("Primary rising: %.0f mins\n",60*n);
   printf("Secondary kneading: %.0f mins\n",33*n);
   printf("Secondary rising: %.0f mins\n",30*n);
   printf("Loaf shaping: %.0f seconds\n",2*n);
   printf("Final rising: %.0f mins\n",75*n);
   printf("Baking: %.0f mins\n",35*n);
   printf("Cooling: %.0f mins\n",30*n);
```

```
   printf("Total time: %.0f mins and %.0f seconds\n",(20*n + 60*n + 33*n + 30*n + 75*n + 35*n + 30*n),
2*n);
}

void white_bread_manual(double n)
{
   printf("Primary kneading: %.0f mins\n",15*n);
   printf("Primary rising: %.0f mins\n",60*n);
   printf("Secondary kneading: %.0f mins\n",18*n);
   printf("Secondary rising: %.0f mins\n",20*n);
   printf("Loaf shaping: %.0f seconds\n",2*n);
   printf("Stop after the loaf-shaping cycle and remove the dough for manual baking.\n");
   printf("Total time: %.0f mins and %.0f seconds\n",(15*n + 60*n + 18*n + 20*n), 2*n);
}

void sweet_bread_manual(double n)
{
   printf("Primary kneading: %.0f mins\n",20*n);
   printf("Primary rising: %.0f mins\n",60*n);
   printf("Secondary kneading: %.0f mins\n",33*n);
   printf("Secondary rising: %.0f mins\n",30*n);
   printf("Loaf shaping: %.0f seconds\n",2*n);
   printf("Stop after the loaf-shaping cycle and remove the dough for manual baking.\n");
   printf("Total time: %.0f mins and %.0f seconds\n",(20*n + 60*n + 33*n + 30*n), 2*n);
}
```

O/P

Enter the type of bread (w for White and s for Sweet)>> w
Enter the loaf size (1 for double and 0 for single)>> 0
Enter the baking type (1 for manual and 0 for automatic)>> 0
Primary kneading: 15 mins
Primary rising: 60 mins
Secondary kneading: 18 mins
Secondary rising: 20 mins
Loaf shaping: 2 seconds
Final rising: 75 mins
Baking: 45 mins
Cooling: 30 mins
Total time: 263 mins and 2 seconds

Enter the type of bread (w for White and s for Sweet)>> s
Enter the loaf size (1 for double and 0 for single)>> 1
Enter the baking type (1 for manual and 0 for automatic)>> 1
Primary kneading: 30 mins
Primary rising: 90 mins
Secondary kneading: 50 mins
Secondary rising: 45 mins
Loaf shaping: 3 seconds
Stop after the loaf-shaping cycle and remove the dough for manual baking.
Total time: 214 mins and 3 seconds

11. Ans:

```
# include <stdio.h>

int within_x_percent(double, double, double);

int main()
```

```
{
   double bp;
   printf("Enter the observed boiling point of a substance in °C>> ");
   scanf("%lf",&bp);
   if(within_x_percent(100, bp, 5))
   printf("Substance is Water.\n");
   else if(within_x_percent(357, bp, 5))
   printf("Substance is Mercury.\n");
   else if(within_x_percent(1187, bp, 5))
   printf("Substance is Copper.\n");
   else if(within_x_percent(2193, bp, 5))
   printf("Substance is Silver.\n");
   else if(within_x_percent(2660, bp, 5))
   printf("Substance is Gold.\n");
   else
   printf("Substance unknown.\n");
   return 0;
}

int within_x_percent(double ref, double data, double x)
{
   if((data >= (ref - x*ref/100)) && (data <= (ref + x*ref/100)))
   return 1;
   else
   return 0;
}
```

O/P

Enter the observed boiling point of a substance in °C>> 2175
Substance is Silver.

Enter the observed boiling point of a substance in °C>> 50
Substance unknown.