



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 1 Examination in Engineering, March 2026

Module No: EE1102

Module Name: Programming Fundamentals

Part-A

[Part-A + Part-B = 2 hours]

Programming Language: Python

Instructions for candidates

- Answer in the sheet provided by putting X mark on the letter: (a), (b), (c), or (d) which corresponds to the correct answer, by using a black or blue pen.
- Question paper contains 40 multiple choice questions.
- Answer all questions. Each question has only one answer.
- Each correct answer carries 0.5 marks.

1. Consider the following code snippet: `age = input("Enter your age: ")`. If the user types 20 and presses Enter, what is the result of the expression `age + 5`?
 - (a) 25
 - (b) "205"
 - (c) A `TypeError` occurs
 - (d) "25"
2. An engineer calculates a resistance value as $R = 14.5678$. Which f-string format specifier correctly rounds and displays this value as 14.57?
 - (a) `{R:.2f}`
 - (b) `{R:.2}`
 - (c) `{R:2f}`
 - (d) `{R:round(2)}`
3. An engineering student needs to calculate the cosine of an angle for a truss analysis program using Python's built-in mathematics functions. Which statement must be included at the top of the script?
 - (a) `include math`
 - (b) `using namespace math`
 - (c) `import math`
 - (d) `require math`

4. An engineer is formatting a diagnostic table for a battery system. What is the exact output of the following Python code snippet?

```
cell = "B1"
volt = 3
print(f"|{cell:<4}|{volt:^5}|")
```

- (a) |B1 | 3 |
 - (b) | B1| 3 |
 - (c) | B1 | 3 |
 - (d) |B1 | 3|
5. A student is writing a Python program to process an array of voltage readings from a data logger. Which built-in function must they use to find the total number of items in that list?

- (a) size()
- (b) count()
- (c) len()
- (d) length()

6. An automated manufacturing system groups machined parts into batches of 60. Which output exactly matches the result of the following Python code used to calculate the batches and leftover parts?

```
total_parts = 250
batch_size = 60

full_batches = total_parts // batch_size
leftover = total_parts % batch_size

print(f"Batches: {full_batches}, Leftover: {leftover}")
```

- (a) Batches: 4.166, Leftover: 10
 - (b) Batches: 4, Leftover: 10
 - (c) Batches: 4, Leftover: 0.166
 - (d) Batches: 4, Leftover: 16
7. How would you correctly write the electrical engineering formula for parallel resistance,

$$R = \frac{R_1 R_2}{R_1 + R_2}$$

, in Python?

- (a) $R = R_1 * R_2 / R_1 + R_2$
- (b) $R = (R_1 * R_2) // (R_1 + R_2)$
- (c) $R = (R_1 * R_2) / (R_1 + R_2)$
- (d) $R = R_1 (R_2) / (R_1 + R_2)$

8. An engineer wants to print a visual separator line consisting of 20 dashes across the console. Which Python expression correctly generates this string?
- (a) `"-" x 20`
 - (b) `repeat("-", 20)`
 - (c) `"-" * 20`
 - (d) `"-" + 20`
9. An engineer wants to display three consecutive temperature readings on the same line using three separate `print()` statements. Which parameter must be added to the `print()` function to prevent it from automatically moving to a new line each time?
- (a) `sep=" "`
 - (b) `newline=False`
 - (c) `end=" "`
 - (d) `next=" "`
10. An engineer uses a loop to iterate backwards through a series of even-numbered test frequencies. What exact sequence of numbers is generated by the expression `list(range(10, 2, -2))`?
- (a) `[10, 8, 6, 4, 2]`
 - (b) `[10, 8, 6, 4]`
 - (c) `[8, 6, 4, 2]`
 - (d) `[10, 9, 8, 7, 6, 5, 4, 3]`
11. An engineer is analyzing a list of daily temperature readings. What is the exact output of the following Python code snippet?
- ```
temps = [22.1, 23.5, 24.0, 21.8, 20.5, 19.0]
subset = temps[1:4]
print(subset)
```
- (a) `[22.1, 23.5, 24.0, 21.8]`
  - (b) `[23.5, 24.0, 21.8]`
  - (c) `[23.5, 24.0, 21.8, 20.5]`
  - (d) `[24.0, 21.8, 20.5]`
12. To extract the **last three** voltage readings from a list of varying length named `readings`, which slicing syntax must an engineer use?
- (a) `readings[:-3]`
  - (b) `readings[3:]`
  - (c) `readings[-3:]`
  - (d) `readings[-3:-1]`

13. A student wants to completely reverse the order of elements in an array of signal frequencies. Which slice operation correctly reverses the list `freq = [10, 20, 30, 40]`?

- (a) `freq[0:-1]`
- (b) `freq[reverse]`
- (c) `freq[::-1]`
- (d) `freq[-1:0]`

14. An engineer writes the following Python code to simulate pressure buildup in a tank. What is the outcome of executing this loop?

```
pressure = 0
while pressure != 100:
 pressure = pressure + 30
```

- (a) The loop stops successfully when pressure reaches 90.
- (b) The loop stops successfully when pressure reaches 120.
- (c) The loop stops with a `ValueError`.
- (d) The loop runs infinitely

15. An engineer writes the following code to classify the operational state of a centrifuge. What is the exact final value of the variable `state`?

```
rpm = 4500

if rpm > 2000:
 state = "Spinning"
elif rpm > 4000:
 state = "Overspeed"
else:
 state = "Stopped"
```

- (a) "Overspeed"
- (b) "Spinning Overspeed"
- (c) ["Spinning", "Overspeed"]
- (d) "Spinning"

16. An engineer is programming a safety system that must trigger an alarm if a boiler's pressure is either below 50 psi or above 100 psi. Which Python `if` statement correctly implements this logic?

- (a) `if pressure < 50 and pressure > 100:`
- (b) `if pressure < 50 or > 100:`
- (c) `if 50 > pressure > 100:`
- (d) `if pressure < 50 or pressure > 100:`

17. Consider the following Python code written for a robotic arm controller:

```
def set_angle(target_degrees):
 # servo movement logic goes here
 pass
```

```
set_angle(45)
```

In this specific snippet, what are the exact technical terms for `target_degrees` and `45`, respectively?

- (a) `target_degrees` is the Argument, `45` is the Parameter.
  - (b) `target_degrees` is the Parameter, `45` is the Argument.
  - (c) Both are technically considered Arguments.
  - (d) Both are technically considered Parameters.
18. An engineer writes the following code to adjust a sensor's global calibration offset. What is the exact value printed to the console?

```
offset = 5.0
```

```
def calibrate(reading):
 offset = 0.0
 return reading + offset
```

```
calibrate(10.0)
print(offset)
```

- (a) `0.0`
  - (b) `5.0`
  - (c) `10.0`
  - (d) A `NameError` occurs.
19. A function is defined to calculate the gravitational force on an object:
- ```
def calculate_force(mass, gravity=9.81):
    return mass * gravity
```
- What happens if this function is called using exactly one argument, such as `calculate_force(10)`?
- (a) It returns `98.1`
 - (b) It throws a `TypeError` for a missing required positional argument.
 - (c) It returns `10` because the `gravity` variable is ignored.
 - (d) It throws a `SyntaxError` because default arguments must be declared first.
20. What is the exact outcome of executing the following function for a boiler safety system?

```
def check_pressure(psi):
    if psi > 50:
        return "CRITICAL"
    return "SAFE"
```

```
print("Diagnostic Complete")
```

```
status = check_pressure(60)
```

- (a) It returns "CRITICAL" and then prints "Diagnostic Complete".
 - (b) It returns "CRITICAL" and immediately exits the function, entirely skipping the print statement.
 - (c) It throws a SyntaxError because a function cannot have two return statements.
 - (d) It returns "SAFE" because the last return statement overrides the first one.
21. An engineer is writing a Python script to read voltage values from a 4-channel analog-to-digital converter (ADC). What specific exception is raised when the following code is executed?
- ```
adc_channels = [3.3, 5.0, 1.2, 0.0]
reading = adc_channels[4]
```
- (a) ValueError
  - (b) KeyError
  - (c) IndexError
  - (d) OutOfRangeError
22. An engineer writes the following code to process incoming telemetry data. What is the exact output printed to the console?
- ```
try:
    data = "Offline"
    voltage = float(data)
    print("Reading complete.")
except ValueError:
    print("Data corrupted.")

print("System standby.")
```
- (a) Data corrupted. followed by System standby.
 - (b) Reading complete. followed by System standby.
 - (c) Data corrupted. only.
 - (d) The program terminates immediately with a ValueError.
23. An engineering student is defining a variable to store the output of a temperature sensor. Which of the following is a syntactically valid variable name in Python?
- (a) sensor-1
 - (b) 1st_sensor
 - (c) yield
 - (d) sensor_1

24. An engineer is calculating the required tensile strength for a cable using a simplified polynomial expression. According to Python's order of operations, what is the exact output of the following code?

```
strength = 15 - 3 * 2 ** 3 + 4
print(strength)
```

- (a) -13
- (b) 100
- (c) -5
- (d) -197

25. An automated pump removes 4 liters of fluid per cycle from a reservoir. What is the exact output printed to the console after this Python code executes?

```
volume = 15
cycles = 0
while volume >= 5:
    volume -= 4
    cycles += 1
print(f"Vol: {volume}, Cycles: {cycles}")
```

- (a) Vol: 7, Cycles: 2
- (b) Vol: 3, Cycles: 3
- (c) Vol: -1, Cycles: 4
- (d) Vol: 5, Cycles: 3

26. A microcontroller receives a serial data string containing binary status bits separated by commas. An engineer writes the following code to clean the stream. What is the exact final value of parsed_data?

```
stream = "1,0,1"
parsed_data = ""

for bit in stream:
    if bit == ',':
        continue
    parsed_data = parsed_data + bit
```

- (a) 101
- (b) "1"
- (c) "101"
- (d) "1 0 1"

27. An electrical engineering script is designed to calculate the total valid voltage supplied by a solar array over a time period. What is the exact final value of total_voltage?

```
readings = [12.0, -99.0, 14.5, 0.0, 11.5]
total_voltage = 0

for v in readings:
    if v > 0:
        total_voltage = total_voltage + v
```

- (a) -61.0
(b) 38.0
(c) 3
(d) 26.0
28. An engineer writes a script to calculate the number of unique, non-repeating communication links required to connect a small mesh network. What is the exact final value of the variable `links`?
- ```
links = 0
for i in range(4):
 for j in range(i):
 links += 1
```
- (a) 16  
(b) 10  
(c) 6  
(d) 12
29. An autonomous robotic arm maintains a list of sequential commands. An engineer updates the sequence using the `insert()` and `append()` methods. What is the exact content of the tasks list after this code executes?
- ```
tasks = ['calibrate', 'scan', 'move']
tasks.insert(1, 'grip')
tasks.append('release')
```
- (a) ['calibrate', 'grip', 'scan', 'move', 'release']
(b) ['calibrate', 'scan', 'grip', 'move', 'release']
(c) ['grip', 'calibrate', 'scan', 'move', 'release']
(d) ['calibrate', 'scan', 'move', 'grip', 'release']
30. A network script processes an array of incoming packet IDs. It needs to extract the very last packet for immediate processing and then remove the first occurrence of a specific error code (102). What is the final state of the packets list?
- ```
packets = [105, 102, 108, 102, 110]
last_packet = packets.pop()
packets.remove(102)
```
- (a) [105, 108, 110]  
(b) [105, 102, 108, 102]  
(c) [105, 108, 102]  
(d) [102, 108, 102, 110]

31. An engineer uses the `del` keyword and list slicing to clear out a block of corrupted memory registers from a buffer. What elements remain in the buffer list after execution?

```
buffer = [0, 1, 2, 3, 4, 5]
del buffer[1:3]
```

- (a) [0, 3, 4, 5]
- (b) [0, 4, 5]
- (c) [1, 2]
- (d) [0, 1, 4, 5]

32. A thermal management system stores current temperature readings in a dictionary. An engineer needs to iterate through the data to print both the hardware component and its corresponding temperature. Which of the following for loop headers correctly unpacks both the key and the value?

```
thermal_data = {"CPU": 65, "GPU": 82, "RAM": 45}
```

```
-----:
 print(f"{sensor} is at {temp} degrees.")
```

- (a) `for sensor, temp in thermal_data:`
- (b) `for sensor, temp in thermal_data.items():`
- (c) `for sensor, temp in thermal_data.keys():`
- (d) `for sensor, temp in thermal_data.values():`

33. A Python script initializes a configuration dictionary for a PostgreSQL database connection. What is the exact length of the `db_config` dictionary after the following code executes?

```
db_config = {"host": "localhost", "port": 5432, "ssl": True}
db_config["port"] = 5433
db_config["timeout"] = 30
```

- (a) 3
- (b) 4
- (c) 5
- (d) An error occurs because dictionaries cannot be modified after creation.

34. An engineer is prototyping a toolpath for an automated 2D plotter using the Python `turtle` module. The plotter begins at the origin (0, 0) facing East (0 degrees). What is the exact final (x,y) coordinate position of the pen after executing the following sequence?

```
import turtle
plotter = turtle.Turtle()

plotter.forward(100)
plotter.left(90)
plotter.forward(50)
plotter.left(90)
plotter.forward(100)
```

- (a) (100, 50)
- (b) (0, 50)
- (c) (0, 0)
- (d) (-100, 50)

35. An engineer is writing a Python simulation for a CNC mill cutting the perimeter of a regular octagonal sensor housing. To complete the shape, the mill must make 8 equal turns. What exact value must replace the blank to correctly draw the octagon?

```
import turtle
mill = turtle.Turtle()

for _ in range(8):
 mill.forward(50)
 mill.right(_____)
```

- (a) 135
- (b) 45
- (c) 8
- (d) 60

36. A student is simulating a robotic laser cutter using the turtle module. The laser starts at the origin (0,0). It needs to move to the coordinate (100, 100) to start a new cut, but it must **not** leave a burn mark (draw a line) while traveling there. Which sequence of commands correctly achieves this?

```
import turtle
laser = turtle.Turtle()
Make the travel move without cutting
```

- (a) laser.penup()  
laser.goto(100, 100)  
laser.pendown()
- (b) laser.move(100, 100, draw=False)
- (c) laser.hide()  
laser.goto(100, 100)  
laser.show()
- (d) laser.goto(100, 100)  
laser.clear()

37. An engineer is processing a digital signal to isolate voltage spikes. Using NumPy, they apply a condition directly to the array. What is the exact output of this code?

```
import numpy as np

voltages = np.array([1.2, 5.1, 0.8, 4.8, 3.3])
spikes = voltages[voltages > 4.0]

print(len(spikes))
```

- (a) 2
  - (b) 5
  - (c) [False, True, False, True, False]
  - (d) A `TypeError` is raised because arrays cannot be compared to integers directly.
38. A student is writing a script to convert raw 10-bit analog-to-digital (ADC) sensor readings into actual voltage values (0 to 5V). Using NumPy, they apply a mathematical operation directly to the 1D array. What is the exact output of this code?

```
import numpy as np

raw_adc = np.array([0, 511, 1023])
voltages = raw_adc * (5.0 / 1023)

print(np.round(voltages, 1))
```

- (a) [0. 2.5 5.]
  - (b) A `TypeError` is raised because you cannot multiply an array by a float.
  - (c) [0, 2555, 5115]
  - (d) [0. 5. 10.]
39. An engineer is visualizing temperature and humidity data collected simultaneously from a lab test. What is the exact visual output when the following Matplotlib code is executed?

```
import matplotlib.pyplot as plt

time = [0, 1, 2, 3]
temp = [22, 23, 24, 24]
humidity = [50, 52, 51, 49]

plt.plot(time, temp)
plt.plot(time, humidity)
plt.show()
```

- (a) Two separate windows will open, one containing the temperature data and one for the humidity data.
- (b) Both the temperature and humidity lines will be drawn overlaid on the exact same graph in a single window.
- (c) The humidity plot will overwrite the figure, completely erasing the temperature plot before displaying.
- (d) A `ValueError` is raised because `plt.plot()` can only be called once before `plt.show()`.

40. What is the exact value printed to the console after executing the following Python code?

```
x = 10
```

```
def modify_value():
 x = 20
 x += 5
```

```
modify_value()
print(x)
```

- (a) 10
- (b) 20
- (c) 25
- (d) An UnboundLocalError is raised.