Instructions:

1. The paper has 2 sections and a total of 50 multiple choice questions (MCQ) in 9 pages including this page.

2. **The total time available is 120 minutes.**

3. No paper of any kind (except admit card, original ID proof) or any electronic gadget is allowed in the examination hall.

4. Answers should be marked on the separate answer sheet provided.

5. Each question has 4 choices as possible answers. There is only ONE correct or the closest approximate or appropriate answer.

6. To answer you must darken your chosen option (a circle) for each question with a black/blue pen - do not use a pencil.

7. Ensure that you write your application number and name in the answer sheet.

8. Each correct answer gets 3 marks and each wrong answer gets (-1) mark. Questions that are not attempted do not get any marks.

9. Do not spend too much time on one section. Look through both sections. You may find you are able to do some section(s) better than others.

10. Do not ask for any clarifications on the question paper or questions from the invigilators. They have been advised not to respond to any such clarificatory queries.

11. Return the answer sheet and any rough sheets at the end of the test. You can take the question paper with you.
Part II Section 1: Elementary Psychology and Basics of Hypothesis Testing

**Question 1.** Which of the following is not detected by a mechanoreceptor?
   A. Sound   B. Taste   C. Touch   D. Proprioception

**Question 2.** Selective serotonin reuptake inhibitors are commonly used as drugs for which of the following disorders?
   A. Autism   B. Parkinsons disease   C. Alzheimers disease   D. Depression

**Question 3.** Which of these ions is more abundant inside a typical neuron compared to the extracellular space?
   A. Sodium   B. Potassium   C. Chloride   D. Calcium

**Question 4.** What is approximately the speed of action potential conduction through an unmyelinated axon?
   A. 1 m/s   B. 10 m/s   C. 100 m/s   D. 1 Km/s

**Question 5.** A neurological phenomenon in which stimulation of one sensory pathway leads to automatic, involuntary experiences in a second sensory pathway is known as:
   A. synesthesia   B. bradykinesia   C. dyskinesia   D. amnesia

**Question 6.** Which one of the following is not a concept of signal detection theory?
   A. $d$ (Sensitivity)   B. DL   C. The ROC Curve   D. Response Criterion

**Question 7.** Psychophysics is the scientific discipline that
   A. relates the activity of sensory nerve fibers to perception.
   B. characterizes the physical nature of sensory stimulation
   C. compares human perceivers to a computer-generated mode
   D. relates a sensory stimulus to a perceptual event

**Question 8.** According to Weber’s law, the relationship between absolute intensity of a stimulus and difference threshold is
   A. Difference threshold is independent of intensity of the stimulus
   B. Difference threshold decreases linearly with intensity
   C. Difference threshold has an inverted u-shaped relationship with intensity (first increases then decreases)
   D. Increase in difference threshold is proportional to stimulus intensity.
Question 9. Sensitivity for detecting a signal (d’) can be calculated based on a participant’s performance using the following formula.

A. \( z(\text{Hit Rate}) - z(\text{False Alarm}) \)
B. \( z(\text{Hit Rate}) - z(\text{Misses}) \)
C. \( z(\text{Misses}) - z(\text{False Alarm}) \)
D. \( z(\text{Hit Rate}) - z(\text{Misses}) \)

Question 10. What is the term for the assumption that different cognitive processes each have their own separate area of the brain designated to that process?

A. Specificity  
B. Double dissociation  
C. Independence  
D. Functional specialization

Question 11. The finding that the last few items in the list are usually better remembered in immediate recall is best known as

A. Primacy effect  
B. Recency effect  
C. Immediacy effect  
D. Similarity effect

Question 12. Which of the following best expresses the difference between classical conditioning and operant conditioning?

A. Classical conditioning relates the behaviour to a reward or punishment, operant conditioning does not.
B. Operant conditioning is a procedure used only on animals; classical conditioning is also used in psychotherapy.
C. Operant conditioning uses the pairing of two stimuli; classical conditioning does not.
D. Operant conditioning relates behaviour to its consequences; classical conditioning does not.

Question 13. The most commonly used measure of operant behaviour is

A. reaction time  
B. response rate  
C. response magnitude  
D. number of correct responses

Question 14. In classical conditioning, learning is evident when

A. stimulus automatically produces a response without a prior history of experience.
B. stimulus which did not initially produce a response now elicits that response.
C. spontaneously emitted response increases in frequency as a result of its consequences.
D. subject repeats an action he or she has observed in another and is praised for it.

Question 15. In operant conditioning, what is the relationship between events critical to learning and the response to be learned?

A. They occur before the response.
B. They occur after the response.
C. They occur simultaneously with the response.
D. They are unrelated to the response.
Question 16. The right hemisphere is primarily responsible for:
   A. Complex voluntary movement   B. Language and verbal information processing   C. Spatial processing   D. Verbal memory

Question 17. Which of the following is a binocular cue for depth perception?
   A. motion parallax   B. size   C. disparity   D. texture gradient

Question 18. When asked to fill in the blanks of the following: ‘‘I wish my sist-r would n-ver ansr the t-lep-on-’’, we are demonstrating
   A. Saccadic action   B. The amount of information we bring to the task of common reading   C. Reliance on vowels in English language   D. Stereotype about sisters in particular and women in general

Question 19. Which one of the following statements is not true?
   A. Light produces sensory neural impulse in retina   B. Four kinds of chemicals are found in rods and cones of retina   C. Rods become active in bright light   D. Density of cones on fovea is greater than that of rods

Question 20. A Necker cube helps to demonstrate that
   A. perceptions have qualities not present in the physical stimulus.   B. interpretations of physical stimuli are stable and dependable.   C. the physical world is entirely a product of the mind.   D. changes in appearance are due to changes in the physical stimulus.

Question 21. Which of the following best states the rationale for performing a test of statistical significance?
   A. Causal relationships are to be inferred from correlational data.   B. To test whether a hypothesis (the null hypothesis) is very unlikely to be true.   C. A pilot study needs to be conducted to determine whether subjects vary on a proposed measure of a dependent variable.   D. Conclusions are drawn regarding the practical importance of the findings of a study.

Question 22. A p-value is
   A. the probability of the null hypothesis being true.   B. the probability of the null hypothesis being false.   C. the probability of the alternative hypothesis being true.   D. the probability of getting the sample mean that you got (or a value more extreme) assuming the null hypothesis is true.
Question 23. If Type I error probability, $\alpha$, is 0.05 in a t-test, then
   A. we have a 5% probability of rejecting the null hypothesis when it is actually true
   B. we have a 95% probability of rejecting the null hypothesis when it is actually true
   C. we necessarily have low power
   D. we necessarily have high power

Question 24. Type II error probability is
   A. the probability of accepting the null when it is true
   B. the probability of accepting the null when it is false
   C. the probability of rejecting the null when it is true
   D. the probability of rejecting the null when it is false

Question 25. Power analysis can be used to:
   A. To calculate sample size to detect an effect of a known size.
   B. To compare different statistical testing procedures.
   C. Neither A nor B.
   D. Both A and B.
Part II Section 2: Elementary Mathematics and Basics of Computation

Question 26. If Set $A$ has 3 elements, set $B$ has 7 elements, and their union $(A \cup B)$ has 8 elements. How many elements are present in $A$ but not $B$?

A. 0  B. 1  C. 2  D. 3

Question 27. If $f(x) = x^3 - x^2 - 2$ then $f(-x)$ is:

A. $-x^3 - x^2 - 2$  B. $-x^3 + x^2 - 2$  C. $x^3 + x^2 - 2$  D. $-x^3 - x^2 + 2$

Question 28. If a fair coin (that is probability of heads and tails is equal) is tossed 4 times. What is the probability of observing at least 3 tails?

A. $\frac{1}{2}$  B. $\frac{9}{16}$  C. $\frac{1}{4}$  D. $\frac{5}{16}$

Question 29. What is the value of \(6^{52} - 6^{50}\)?

A. 60  B. 210  C. 420  D. None of the previous

Question 30. Evaluate the expression $\tan(\log(\sin(0) + \cos(0)))$.

A. 0  B. $\frac{9}{16}$  C. $\frac{1}{4}$  D. 4

Question 31. You randomly choose two integers each from the range 1 to 10. What is the probability that one integer is not the square of the other?

A. 0.80  B. 0.85  C. 0.90  D. 0.95

Question 32. The equation $\sqrt{(x+3)^2 + (y-2)^2} = \sqrt{(x-3)^2 + y^2}$ represents a:

A. line  B. circle  C. parabola  D. ellipse

Question 33. What is $\frac{d \ln(e^x)}{dx}$?

A. $e^x$  B. $\frac{1}{e^x}$  C. 1  D. None of the others

Question 34. The area intercepted by the two curves defined by $f(x) = x^2$ and $g(x) = 8 - x^2$ is. (The intercepted area is the area enclosed by the two curves between their points of intersection)

A. 0  B. $\frac{64}{3}$  C. $\frac{32}{3}$  D. $\frac{16}{3}$

Question 35. You are given the following Gaussian (or normal) distribution for random variable $x$:

$$ f(x) = \frac{1}{6.25\sqrt{2\pi}}e^{\frac{x^2-12x+14}{12.5}} $$

The mean and standard deviation of the distribution respectively are:

A. 2 and 2.5  B. 2.5 and 2  C. 2 and $\sqrt{12.5}$  D. 2.5 and $\sqrt{12.5}$

Question 36. You have two dice. Die one is a standard die with the six faces marked from 1 to 6. Die two has two faces each marked with 1, 2 and 3. Both dice are rolled. The probability that the sum of values on the top face of the two dice is greater than 6 is:

A. $\frac{6}{36}$  B. $\frac{8}{36}$  C. $\frac{10}{36}$  D. $\frac{12}{36}$
**Question 37.** You are given the following 3 numbers: \( x = 2^{\frac{1}{2}} \), \( y = 3^{\frac{1}{2}} \), \( z = 6^{\frac{1}{2}} \). Which of the following arrangements is in increasing order?

[Note: You can use: \( \log(2) = 0.3010 \), \( \log(3) = 0.4771 \).]

A. \( x y z \)  B. \( y x z \)  C. \( z x y \)  D. \( z y x \)

**Question 38.** A quadratic function \( f(x) \) attains a minimum value of \(-1\) at \( x = 3 \). The value of the function at \( x = 0 \) is 8. What is the value of \( f(x) \) at \( x = 10 \)?

A. 18  B. 48  C. 60  D. 68

**Question 39.** What is the value of \( \frac{\log(4)}{\log(8)} \)?

A. \( \frac{3}{4} \)  B. \( \frac{1}{\sqrt{2}} \)  C. \( \frac{1}{2} \)  D. \( \frac{2}{3} \)

**Question 40.** Matrix \( A \) is orthogonal when

A. \( AA^T = I \)  B. \( A^T A^T = I \)  C. \( AA = I \)  D. None of the previous

**Question 41.** An Algorithm is:

A. device independent but language dependent
B. device dependent but language independent
C. device dependent and language dependent
D. device independent and language independent.

**Question 42.** Convert the number 1078 from base 10 to base 9. The result is:

A. 977  B. 1297  C. 1427  D. 1497

**Question 43.** Your laptop has a 64-bit processor. How many hexadecimal digits will you need to print a valid memory address on your laptop?

A. 32  B. 16  C. 8  D. 4

**Question 44.** What is the correct form of Bayes theorem?

A. \( P(X|Y) = \frac{P(X)P(Y)}{P(X) + P(Y)} \)
B. \( P(X|Y) = \frac{P(Y|X)P(Y)}{P(X)} \)
C. \( P(X|Y) = \frac{P(Y|X)P(X)}{P(Y)} \)
D. \( P(X|Y) = \frac{P(Y|X)P(X)}{P(X) + P(Y)} \)
Questions 45 and 46 are based on the function defined below in pseudocode.

```plaintext
function TEST1(a, b, c)  ▷ a, b, c are distinct integers
    if (b > a) then
        TEST1(b, a, c)
    else if (c > b) then
        TEST1(a, c, b)
    else
        Print(a, b, c)
    end if
end function
```

**Question 45.** What will be printed when we evaluate: TEST1(−3, −5, −4)?

A. −5 − 4 − 3  
B. −3 − 4 − 5  
C. −3 − 5 − 4  
D. −4 − 5 − 3

**Question 46.** Which of the following correctly describes what the function is doing?

A. Arranging 3 numbers in descending order.
B. Arranging 3 numbers in ascending order.
C. Arranging 3 numbers such that largest is in the middle.
D. Arranging 3 numbers such that smallest is in the middle.

**Question 47.** You are given the following three combinations of boolean functions:

i) AND OR
ii) NOR OR
iii) XOR

Which combination(s) below are universal?

A. Only iii)  
B. Only i)  
C. i) and iii)  
D. Only ii)

**Question 48.** You are given the following pseudocode fragment:

```
Comment: a is a two dimensional matrix, i, j are integers.
for i = 1 to n step 1 do
    for j = 1 to n step 1 do
        a[i][j] = (i/j) × (j/i)
    end for
end for
```

Which statement below best describes what the pseudocode is doing?

A. It is initializing the $n \times n$ matrix with all elements as 0.
B. It is initializing the $n \times n$ matrix with all elements as 1.
C. It is initializing the $n \times n$ matrix with only diagonal elements as 1 and rest as 0. 
D. It is initializing the $n \times n$ matrix with only diagonal elements as 0 and rest as 1.

Questions 49 and 50 are based on the pseudo code below.

```plaintext
function Test2(a, b)  ▷ Assume $a$, $b$ are positive integers
    ans = 1
    while ($b > 1$) do
        if $b$ is even then
            $a = a \times a$
            $b = b/2$
        else
            $ans = ans \times a$
            $b = b - 1$
        end if
    end while
    ans = $ans \times a$
    print($ans$)
end function
```

**Question 49.** What will be printed if we evaluate $TEST2(3, 7)$?
A. 21 B. 2187 C. 343 D. None of the previous

**Question 50.** Which of the functions below is $TEST2$ calculating?
A. $a^b$ B. $b^a$ C. $a \times b$ D. None of the previous