INFORMATION TECHNOLOGY UNIVERSITY

ITU Graduate Admission Test 20XX

Faculty of Engineering

IGAT20XX (MS & PhD)

Name: _____ **Tracking ID:** _____

CNIC: _____ **Roll Number:** _____

Instructions

1. Use of calculators, mobile phones, smart watches and other electronic devices is not allowed.
2. Please make sure your question paper contains **XX printed sides**.
3. You must mark your answers **ONLY** on the answer sheet using the provided ballpoints. Use of pencil on the answer sheet is **NOT** allowed.
4. Be sure that each mark is dark and completely fills the intended space as illustrated in the following example where option **B** is selected: (A) (●) (C) (D)
5. There is **no negative marking**. You must choose only one answer for each question.
6. You may use the question paper for rough work.
7. You must write your name and complete tracking ID clearly on the question paper.
8. Please attempt all MCQs from **compulsory section** and any 5 modules from **elective section**. In case of more than 5 modules are attempted in **elective section**, only first five attempted modules will be considered.
9. You must mark your **Six Digit Numeric Roll Number** on the answer sheet by filling the appropriate circles. e.g. the roll number **063416** would be marked **from top to bottom** as:

N#	0	1	2	3	4	5	6	7	8	9
0	●									
6							●			
3				●						
4					●					
1		●								
6							●			

Paper Pattern (Attempt MCQs: 80)

No.	Compulsory Section – 30 MCQs	MCQs
1.	English (English)	5
2.	Analytical (Analytical)	5
3.	Engineering Mathematics (Math)	20
No.	**Elective Section** **Attempt Only Five Modules– 50 MCQs**	**MCQs**
1.	Digital Logic Design (Logic Design)	10
2.	Circuit Analysis (Circuits)	10
3.	Signals and Systems (Signals)	10
4.	Communication Systems (Communication)	10
5.	Semiconductor Devices (Semiconductor)	10
6.	Microwave Engineering (Microwave)	10
7.	Embedded Systems (Embedded)	10
8.	Operating Systems (Op Sys)	10
9.	Software Engineering (Soft Eng)	10
10.	Computer Architecture (Comp Arc)	10
11.	Computer Programming (Comp Prog)	10

----------Please DO NOT open your question paper until instructed----------

Compulsory Section

1.1 English (English)

[MCQs: 01-5]

Read the passage to answer the questions. (MCQs 01-03)

But man is not destined to vanish. He can be killed, but he cannot be destroyed, because his soul is deathless and his spirit is irrepressible. Therefore, though the situation seems dark in the context of the confrontation between the superpowers, the silver lining is provided by amazing phenomenon that the very nations which have spent incalculable resources and energy for the production of deadly weapons are desperately trying to find out how they might never be used. They threaten each other, intimidate each other and go to the brink, but before the total hour arrives they withdraw from the brink.

1. The main point from the author's view is that
   a) Man's soul and spirit cannot be destroyed by superpowers
   b) Man's destiny is not fully clear or visible
   c) Man's safety is assured by the delicate balance of power in terms of nuclear weapons
   d) Human society will survive despite the serious threat of total annihilation

2. The phrase 'Go to the brink' in the passage means
   a) Retreating from extreme danger
   b) Declare war on each other
   c) Advancing to the stage of war but not engaging in it
   d) Negotiate for peace

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Select the word that best completes the sentence. (MCQs 04-5)

4. Critics of the welfare system argue that, rather than aiding people's efforts to govern their own lives, it _____ their independence.

   a) supports
   b) weakens
   c) hastens
   d) renews

5. He felt that the uninspiring routine of office work was too _____ for someone of his talent and creativity.
   a) diverse
   b) insatiable
   c) exacting
   d) ordinary

1.2 Analytical [MCQs: 6-10]

Read the passage to answer the questions. (MCQs: 6-10)

An editor must choose five articles to be published in the upcoming issue of an arts review. The only articles available for publication are theater articles F, G, H and J, and dance articles K, L, M and O. At least three of the five published articles must be dance articles. If J is chosen, then M cannot be. If F is chosen, then J must also be chosen.

6. If M is not chosen for the issue, which of the following must be chosen?
    a) F
    b) G
    c) H
    d) J
    e) K

…….

10. How many acceptable groupings of articles include J?
    a) One
    b) Two
    c) Three
    d) Four
    e) Five

1.3 Engineering Mathematics (Math)

[MCQs: 11-30]

11. If **A**, **B**, and **C** are square matrices of same dimensions then $(ABC)^{-1}$ =.
    a) $C^{-1}B^{-1}A^{-1}$
    b) $A^{-1}B^{-1}C^{-1}$
    c) $C^{-1}A^{-1}B^{-1}$
    d) $B^{-1}A^{-1}C^{-1}$

12. Given a 4 × 1 vector x, the rank of a matrix $A = xx^t$ is at most
    a) 2
    b) 1
    c) 3
    d) None of the above

13. Product of matrix A and matrix A^{-1} results in matrix classified as
    a) Identity matrix
    b) Matrix A
    c) Inverse matrix
    d) Both A and C

14. The derivative of a function f(x) = |x| at x = 0 is
    a) 1
    b) -1
    c) Does not exist
    d) None of the above

……

27. Let $f\ (x) = \int_x^0 \sqrt{t}\, dt$, then the derivative of $df\ (x)/dx$
    a) $-(2/3)x^{2/3}$
    b) $-(2/3)x^3$
    c) $-\sqrt{x}$
    d) None of the above

28. In the figure the length of the chord AB is
    a) 4
    b) 5
    c) 6
    d) 8

29. The line y = mx + c intersects the circle $x^2 + y^2 = a^2$ at most of …… points
    a) 1
    b) 2
    c) 3
    d) 4

30. What is the average of all prime numbers between 20 and 40?
    a) 20
    b) 25
    c) 30
    d) 35

Elective Section

2.1 Digital Logic Design (Logic Design) [MCQs: 31-40]

31. Which of the following logic gates will always give a LOW output whenever a HIGH input is applied to one of its input?
    a) NOR
    b) OR
    c) AND
    d) NAND

32. What would the even parity bit be for the code 0011011?
    a) HIGH
    b) LOW
    c) Either 0 or 1
    d) None of the above

33. The Boolean expression $Y = \overline{(A + B)}$ describes a two-input _____ gate.
    a) AND
    b) OR
    c) NAND
    d) NOR

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40. The Boolean expression $(A + B + C)(A' + B' + C')$ has a dual _____
    a) $(A' + B' + C')(A + B + C)$
    b) $(ABC)(A'B'C')$
    c) $ABC + A'B'C')$
    d) $(A' + B' + C') + (A + B + C)$

2.2 Circuit Analysis (Circuit) [MCQs: 41-50]

41. If the distance between the plates of a capacitor decreases while all other components of the capacitor remain the same, what happens to the capacitance of the device?
    a) increases
    b) remains the same
    c) decreases
    d) varies

42. What is the total resistance of the circuit in Figure 1?
    a) 10 Ω
    b) 25 Ω
    c) 40 Ω
    d) 55 Ω

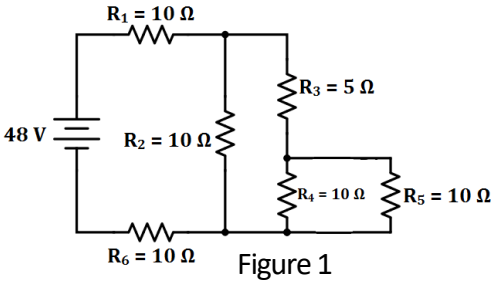
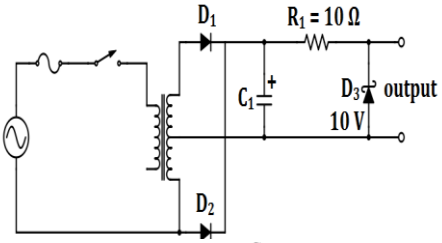


Figure 1

43. The voltage across the terminals of a capacitor is *v* and the current through it is *i*. Which of the following statement is true?
    a) *v* cannot change instantaneously
    b) *i* cannot change instantaneously
    c) Both *v* and *i* cannot change instantaneously
    d) None of the above



44. The voltage between nodes *a* and *b* in the circuit shown in Figure 3 is:
    a) -5V
    b) 10V
    c) 15V
    d) -10V

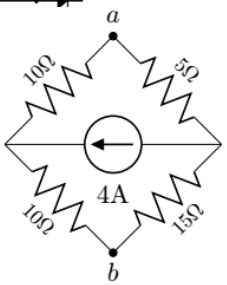


Figure 3

45. The power absorbed by a lamp connected to a 12V source when it draws 2.5A current is:
    a) 4:8W
    b) 30W
    c) 14:5W
    d) 60W

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50. The time constant for an RL circuit with R = 2Ω and L = 4 H is:
    a) 0.5 sec
    b) 2 sec
    c) 4 sec
    d) 8 sec

2.3 Signals and Systems (Signals) [MCQs: 51-60]

51. A continuous time signal x(t) = cos(2π10t) + cos(2π20t) is sampled at 30 samples per second. The aliased frequencies in the discrete spectrum occur at ω =
    a) ±4π/3
    b) ±2π/3
    c) ±π
    d) none of the above

52. An LTI system with impulse response h[n] = δ[n] − δ[n − 1] is
    a) An all-pass filter
    b) A low-pass filter
    c) A high pass filter
    d) A bandpass filter

53. The frequency response of an LTI system is $H(\omega) = 1 - e^{-j\omega}$. The output $y[n]$ of this system in response to an input $x[n] = (-1)^n$ is
    a) $y[n] = (-1)^n(1 - e^{-j\omega})$
    b) $y[n] = (-1)^n(1 + e^{-j\omega})$
    c) $y[n] = 2\cos(\pi n)$
    d) None of the above

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60. A discrete signal x[n]=cos([3/5]n) is
    a) periodic with period 3
    b) periodic with period 5
    c) periodic with period 5/3
    d) aperiodic

2.4 Communication Systems (Communication) [MCQs: 61-70]

61. Given a band-limited signal with bandwidth B Hz, which of the following is true?
    a) bandwidth of both AM signal and NBFM signal is 2B Hz
    b) bandwidth of both AM signal and NBFM signal is B Hz
    c) bandwidth of AM signal is 2B Hz and bandwidth of NBFM signal is 2(df+B) Hz (df is the frequency deviation)
    d) bandwidth of AM signal is B Hz and bandwidth of NBFM signal is 2(df+B) Hz

62. Which one of the following schemes is not a "Constant power" modulation scheme:
    a) PSK
    b) QAM
    c) GMSK
    d) FSK

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70. Consider the Shannon's formula: $C = B\log_2(1 + SNR)$. Then, one can easily identify that in order to increase channel capacity (i.e., maximum achievable rate), one needs to either increase the transmit power (i.e., SNR), or, increase the system bandwidth B. Assume that the system operates in high SNR regime and that it costs the same amount of money X to increase the transmit power or bandwidth by, say, an order of magnitude (i.e., 10 times). Then, which system parameter will be cheaper for the

operator (in terms of operational cost), to achieve, say, a data rate Y?

a) Bandwidth B
b) SNR (i.e., Transmit power)
c) Both of the above
d) None of the above

2.5 Semiconductor Devices (Semiconductor) [MCQs: 71-80]

71. In semiconductors, as the doping increases, the resistivity
    a) Increases
    b) Decreases
    c) Remains Same
    d) No relationship

72. In semiconductors, as the doping increases, the junction capacitance
    a) Increases
    b) Decreases
    c) Remains Same
    d) No relationship

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80. In semiconductors, as the doping increases, the mobility
    a) Increases
    b) Decreases
    c) Remains Same
    d) No relationship

2.6 Microwave Engineering (Microwave) [MCQs: 81-90]

81. The dot product of the vector $\vec{A}$ and $\vec{B}$ when $\vec{A} = 3a_y - 2a_z$ and $\vec{B} = 2\vec{A}$ will be
    a) 6
    b) 3
    c) 2
    d) 26

82. According to Snell's law for electromagnetic waves
    a) $\cos\theta_i/\cos\theta_r = n_1/n_2$
    b) $\sin\theta_i/\sin\theta_r = n_2/n_1$
    c) $\sin\theta_i/\sin\theta_r = n_1/n_2$
    d) $\mathrm{Cos}\,\theta_i/\cos\theta_r = n_2/n_1$

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90. The distance between successive maxima and minima is given by
    a) $\lambda/2$
    b) 2λ
    c) λ
    d) $\Lambda/4$

2.7 Embedded Systems (Embedded) [MCQs: 91-100]

91. "Over the history of computing hardware, the number of transistors in a dense integrated circuit has doubled approximately every two years." The name of this law is:
    a) Exponential Law
    b) Moore's Law
    c) Amdahl's Law
    d) Transistor Transistor Law (TTL)

92. Following is a necessary feature of a 32 bit processor
    a) 32 bit address
    b) 32 bit registers
    c) 32 bit instruction
    d) 32 I/O pins

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100. In synchronous circuits; the phenomenon that the same clock arrives at different components (generally latches or flip-flops) at different times, is called
    a) Clock mismatch
    b) Clock Jitter
    c) Clock tolerance
    d) Clock Skew

2.8 Operating Systems (Op Sys) [MCQs: 101-110]

101. Which of the following is NOT a primary function of an operating system?
    a) Resource allocation
    b) Process management
    c) File management
    d) Algorithm design

102. Which of the following scheduling algorithms gives priority to the process with the highest priority number?
    a) Round Robin
    b) Shortest Job First
    c) First-Come, First-Serve
    d) Priority Scheduling

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110. Which of the following is a type of inter-process communication mechanism used by operating systems?
    a) Message Passing
    b) Shared Memory
    c) Both of the above
    d) None of the above

2.9 Software Engineering (Soft Eng) [MCQs: 111-120]

111. Which of the following is NOT a software development process model?
    a) Waterfall Model
    b) Agile Model
    c) Spiral Model
    d) Building Model

112. Which of the following is NOT a characteristic of a good software requirement?
    a) Consistent
    b) Complete
    c) Ambiguous
    d) Feasible

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120. Which of the following is a type of software maintenance that involves fixing errors or defects in the software?
    a) Corrective Maintenance
    b) Adaptive Maintenance
    c) Perfective Maintenance
    d) Preventive Maintenance

2.10 Computer Architecture (Comp Arc) [MCQs: 121-130]

121. Which of the following best describes pipelining in computer architecture?
    a) The process of executing multiple instructions at the same time
    b) The process of dividing an instruction into smaller sub-instructions
    c) The process of overlapping instruction execution stages to increase throughput.
    d) The process of optimizing the layout of transistors in a CPU

122. Which of the following CPU architectures is known for its Complex Instruction Set Computing (CISC) design?
    a) ARM
    b) PowerPC
    c) Intel x86
    d) MIPS

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130. Which of the following is a type of interrupt that occurs when a program attempts to divide a number by zero?
    a) Input/Output Interrupt
    b) Hardware Interrupt
    c) Software Interrupt
    d) Exception Interrupt

2.11 Computer Programming (Comp Prog) [MCQs: 131-140]

131. Which of the following is NOT a programming language?
    a) Java
    b) HTML
    c) Python
    d) Ruby

132. Which of the following data types is used to represent whole numbers in programming?
    a) Float
    b) Double
    c) Integer
    d) Character

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140. Which of the following is a sorting algorithm that has an average time complexity of O(n log n)?
    a) Bubble Sort
    b) Insertion Sort
    c) Selection Sort
    d) Merge Sort
