

This Question Booklet contains
12 printed pages

PGBM

A
Seal Sticker

Total Marks : 100
Time : 100 Minutes

Question
Booklet
Code :

A

Candidate's
Seat No. :

Candidate's Signature _____ Block Supervisor's Signature _____

DO NOT OPEN QUESTION BOOKLET UNTIL INSTRUCTED.

INSTRUCTIONS FOR CANDIDATE:

1. Check Number printed on your OMR SHEET and Question Paper with your SEAT No. before answering the questions. Consult block supervisors in case the above mentioned numbers do not match with your seat number.
2. There are total 100 questions. For answer of each question A, B, C, D, E options are given in OMR SHEET. In OMR SHEET, there is "E" option. "E" option is for "Not Attempted". If candidate do not wish to answer the question he/she should select "E" option (Not Attempted). All questions are compulsory.

For Example:

Which state of India has the longest sea shore ?

A ☐ B ☐ C ☒ D ☐ E ☐

(A) Maharashtra (B) Tamilnadu
(C) Gujarat (D) Andhra Pradesh

In this example, the right answer is (C). Therefore, the Circle of (C) has been darkened (encoded). Candidate should not give the answer "Gujarat" in writing.

The options once darkened/answered by candidate cannot be changed.

3. Candidates are not permitted to leave examination hall during examination.
4. Candidates must strictly enter SEAT NO. in the designated space provided in OMR SHEET as well as Question Paper neatly as soon as they receive the OMR SHEET & Question Paper.
5. Candidates must not write name or put any identification sign/symbol on OMR SHEET. In such case strict disciplinary action will be taken against candidate & will be considered disqualified/ineligible. Only Seat No. must be

entered at designated space provided in OMR SHEET.

6. Both, Candidate's & Supervisor's signature must be done on Certificate of OMR SHEET. Unsigned OMR SHEET would not be considered for evaluation.
7. Candidates are not permitted to use or carry with them any kind of literature, guide, hand written notes, or printed books, mobile phone, pagers, smart watches, camera or any electronic gadgets to examination hall.
8. Use of only Non-scientific / Non-programmable calculator shall allow during examination.
9. Candidates are not permitted to talk/discuss in the Examination Hall. Any candidate found violating supervisor's instructions will be disqualified.
10. Candidates must fully darken circle A, B, C, D and E accordingly with Blue / Black ball pen. If answers are marked with any other coloured ball pen, pencil, white ink (whitner), any corrections are done by candidate by means of blade or rubber or whitner will not be considered for evaluation.
11. Candidates may carry QP with them after Examination.
12. **For correct answer 1 (One) marks will be given.**

If candidate gives more than one option as answer for one question in answer sheet (OMR SHEET), or gives wrong answer then the candidate will be allotted Zero (0) marks.

If candidate does not want to answer a particular question and marks (E) or leave the option without encoding on OMR sheet, then no minus marks will be given.

Submit the OMR SHEET to the block supervisor after completion of examination without fail before leaving examination hall, failure to do so will result in disqualification of the candidature for the examination and disciplinary action will be taken against such candidate.

1. The bioelectric generator of heart is situated at
 (A) Aortic valve (B) SA node
 (C) AY node (D) The brain
2. Among the contact media like Alcohol, Electrode pastes, Saline and multipoint electrode, which has the lowest impedance of 1 Hz?
 (A) Alcohol (B) Saline
 (C) Multipoint electrode (D) Electrode paste
3. Suddenly involuntary drop in body core temperature below 35°C is called
 (A) Accidental hyperthermia (B) Accidental exothermia
 (C) Accidental misothermia (D) Accidental hypothermia
4. The principal ion that is not involved with the phenomena of producing cell potential is
 (A) Chlorine (B) Hydrogen
 (C) Sodium (D) Potassium
5. After a cell is stimulated a finite period of time is required for the cell to return to its pre-stimulus state. This period is known as
 (A) restoration period (B) regain period
 (C) refractory period (D) regenerative period
6. Which of the following electrode has high input impedance Z_i ?
 a) Surface electrode b) Microelectrode c) Needle electrode d) Disc electrode
 (A) option a (B) option b
 (C) option c (D) option d
7. Renal arteries delivers _____ of resting cardia output to kidney.
 (A) 15-20% (B) 20-25%
 (C) 30-35% (D) 5-10%
8. Which of the following nuclear cell is the most commonly used as nuclear power source of pacemaker?
 (A) Uranium (B) Thorium
 (C) Plutonium (D) None of the above
9. Which of the following joint has the lowest degree of freedom?
 (A) Knee (B) shoulder
 (C) Hip (D) Neck
10. Which of the following is the most widely used image format in hospital for storing medical images?
 (A) .jpeg (B) .tif
 (C) .bmp (D) .dcm
11. In ventilator, the typical oxygen, nitrous oxide ratio P varies from
 (A) 25 : 75 to 30 : 70 (B) 20 : 80 to 35 : 65
 (C) 21 : 79 to 30 : 70 (D) 20 : 80 to 25 : 75

12. Considering DC defibrillator, in practice if inductor used is 100 mH, then ____% of stored energy is delivered to patient.
 (A) 56% (B) 61%
 (C) 71% (D) 91%
13. The main design feature of pre-gelled disposable electrodes which helps to reduce the possibility of artefacts, drift and baseline wandering is
 (A) High absorbency buffer layer with isotonic electrolyte
 (B) Low absorbency buffer layer with isotonic electrolyte
 (C) High absorbency buffa layer without isotonic electrolyte
 (D) Low absorbency buffa layer without isotonic electrolyte
14. On increasing distance between the plates of a variable capacitor, the displacement capacitance characteristic changes
 (A) proportionally (B) linearly
 (C) exceptionally (D) hyperbolically
15. Which of the following has the widest range of temperature measurement
 (A) Thermocouple (B) RTD
 (C) Thermistor (D) Mercury thermometer
16. The filter used to reject the 50Hz noise picked up from power lines or machinery is
 (A) Band reject filter (B) Notch filter
 (C) Band stop filter (D) All reject filter
17. In a linear system, an input of $5\sin \omega t$ produces an output of $10\cos \omega t$. The output corresponding to $10\cos \omega t$ input, will be equal to
 (A) $5\sin \omega t$ (B) $-5\sin \omega t$
 (C) $20\sin \omega t$ (D) $-20 \sin \omega t$
18. Consider the unity feedback control system with an open loop transfer function $G(s) = \frac{K}{s(s+1)}$.
 The steady state error due to unit step input is
 (A) zero (B) K
 (C) $1/K$ (D) ∞
19. Signal flow graph is used to find
 (A) stability of the system (B) controllability of the system
 (C) transfer function of the system (D) poles of the system
20. The phase lag compensation will
 (A) improve relative stability (B) increase the speed of response
 (C) increase bandwidth (D) increase overshoot
21. Phase margin of a system is used to specify
 (A) relative stability (B) absolute stability
 (C) time response (D) frequency response
22. If the gain of the open loop system is doubled the gain margin
 (A) is not affected (B) gets doubled
 (C) becomes half (D) becomes one fourth

23. If $f(t) = -f(-t)$ and $f(t)$ satisfy the Dirichlet's conditions then $f(t)$ can be expanded in a Fourier series containing
- (A) only sine terms (B) only cosine terms
(C) cosine term and constant terms (D) sine term and a constant term
24. The trigonometric Fourier series of a periodic function can have only
- (A) cosine term (B) sine term
(C) cosine and sine term (D) none of these
25. The average value of the half wave rectified sine wave of amplitude A_m is
- (A) A_m/π (B) $A_m/\sqrt{2}$
(C) $2A_m/\pi$ (D) $A_m/2$
26. Fourier transform $F(j\omega)$ of an arbitrary signal has the property
- (A) $F(j\omega) = F(-j\omega)$ (B) $F(j\omega) = -F(-j\omega)$
(C) $F(j\omega) = F^*(-j\omega)$ (D) $F(j\omega) = -F^*(-j\omega)$
27. The inverse Fourier transform of the function $F(\omega) = \frac{1}{j\omega} \pi \delta(\omega)$ is
- (A) $\sin \omega t$ (B) $\cos \omega t$
(C) $\sin(t)$ (D) $u(t)$
28. Which of the following represents the impulse response of a system defined by $H(Z) = Z^{-m}$?
- (A) $u(n - m)$ (B) $\delta(n - m)$
(C) $\delta(m)$ (D) $\delta(m - n)$
29. A low-pass filter circuit is basically
- (A) differentiating circuit with low time constant
(B) differentiating circuit with larger time constant
(C) an integrating circuit with low time constant
(D) an integrating circuit with larger time constant
30. The impulse response of a filter matched to a rectangular pulse is
- (A) an attenuator (B) a low pass filter
(C) a high pass filter (D) an equalizer
31. Identify the software interrupt instruction in 8085 microprocessor
- (A) INT (B) RST 5
(C) RST 7.5 (D) RST 6.5
32. Binary division of $(110.10)_2$ by $(0.101)_2$ results in answer
- (A) $(101)_2$ (B) $(1001)_2$
(C) $(0100)_2$ (D) $(1100)_2$
33. If 8085 microprocessor requires external ROM of 8 K, then the address range of ROM will be from
- (A) 0000 H – 1 FFF H (B) 0000 H – 2 FFF H
(C) 0000 H – 3 FFF H (D) 0000 H – 4 FFF H

34. A magnitude comparator for a 4 bit number has four _____ and one _____ gate
 (A) EXNOR, AND (B) NOR, AND
 (C) AND, EXOR (D) NAND, NOR
35. Which of the following port in 8051 microcontroller requires external pull up resistor in all its pins?
 (A) Port 0 (B) Port 1
 (C) Port 2 (D) Port 3
36. 8051 when powered by a supply voltage of +5V dc, the voltage appearing on ALE pin if internal clock timing is perfect is
 (A) 1.67V dc (B) 2.33V dc
 (C) 0V (D) 5V dc
37. When an interrupt is generated in 8051, and processor attends ISR at assigned vector address, which of the following interrupt flag shall be cleared by the programmer?
 (A) serial (B) external interrupt 0
 (C) external interrupt 1 (D) timer overflow
38. An operational amplifier is
 (A) an indirect coupled amplifier (B) a high gain amplifier
 (C) low open loop voltage gain amplifier (D) Both (B) and (C)
39. An op-amp cannot work as
 (A) Logarithmic amplifier (B) Differentiator
 (C) Power amplifier (D) Signal amplifier
40. Which among the following is a non-linear application
 (A) Voltage follower (B) Summing amplifier
 (C) Averaging amplifier (D) Peak detector
41. For a second order system, if the damping ratio is $\xi = 1$, then the system is called
 (A) over stable (B) critically damped
 (C) marginally stable (D) unstable
42. Which of the following is not neuroglia?
 (A) Astrocytes (B) Multipolar neuron
 (C) Oligodendrocytes (D) Microglia
43. At what threshold potential, does a neuron start to rapidly depolarize?
 (A) 0 mv (B) -55 mv
 (C) -70 mv (D) +40 mv
44. Which of the following is not a process in the cardiac cycle?
 (A) isovolumetric contraction (B) diastole
 (C) isovolumetric relaxation (D) ejection
45. Which is the outer most layer of heart?
 (A) pericardium (B) myocardium
 (C) myocardial fluid (D) epicardium

46. Which of the following is not a part of neuron?
 (A) Axon (B) Nodes of Ranvier
 (C) Cilia (D) Myelin Sheath
47. Aorta originates from which of the following heart chambers?
 (A) Left ventricle (B) Right ventricle
 (C) Left atrium (D) None of these
48. DNA is not present in
 (A) Plasma cells (B) WBC cells
 (C) Hair cells (D) RBC
49. Which of the following is not a type of EEG wave?
 (A) Alpha wave (B) Epsilon wave
 (C) Delta wave (D) Beta wave
50. Pacemaker of the heart is
 (A) AV node (B) SA node
 (C) Bundle of Hiss (D) Purkinje fibers
51. Which of the following is a bone in the ear?
 (A) Ischium (B) Cranium
 (C) Incus (D) Sternum
52. Which of the following is a part of inner ear?
 (A) Pinna (B) Eustachian tube
 (C) Labyrinth (D) Tympanic membrane
53. Which of the following is a radiological finding of rickets?
 (A) Fraying (B) Pencil thin cortex
 (C) Cork screw appearance (D) All of the above
54. A register that responds to _____ pulses is commonly called a gated later.
 (A) positive edge (B) negative edge
 (C) ramp signal (D) pulse duration
55. Which of the following is not a type of cell found in the eye?
 (A) Meissner's capsules (B) Cone cells
 (C) Rod cells (D) Bipolar cells
56. What is the noise level of normal conversation?
 (A) 10-30 dB (B) 30-60 dB
 (C) 60-90 dB (D) 90-120 dB
57. What does Q wave represent in an ECG?
 (A) Repolarization (B) Depolarization
 (C) None of these (D) Hyperpolarization
58. The bio signal frequencies from various sections of the human body are in the
 (A) RF frequency range (B) Microwave range
 (C) 0 to few KHz (D) Few KHz to few MHz

59. The most abundant negative ions in our body are
 (A) Sulphates (B) Chlorides
 (C) Borates (D) Chlorates
60. What are two main types of dialysis?
 (A) Continuous renal replacement therapy peritoneal dialysis.
 (B) Hemofiltration and peritoneal dialysis.
 (C) Hemodialysis and peritoneal dialysis.
 (D) Hemodialysis and continuous renal replacement therapy.
61. In dialysis, the waste products are transferred to dialysate by
 (A) surface tension (B) diffusion
 (C) viscosity variation (D) centrifuge
62. EEG includes wave frequency range from
 (A) Less than 1 Hz to 50 Hz (B) dc to 2000 Hz
 (C) 10 Hz to 1000 Hz (D) 0.05 Hz to 2 KHz
63. EMG is
 (A) Study of brain activity (B) Study of myocardial activity
 (C) Study of muscular activity (D) Study of central nervous system
64. The improper response time of the amplifier in biomedical recorders
 (A) affects the gain of the amplifier
 (B) delays the signals
 (C) changes the shape of the waveform of the signal
 (D) attenuates the signal
65. The EEG signal is originated from
 (A) Glia cells (B) Motor units
 (C) SA node (D) Acetylcholine
66. The RC time constant of a diode detector is too high. This gives rise to
 (A) negative peak clipping
 (B) high dc voltage
 (C) attenuation of high modulating frequency
 (D) diagonal peak clipping
67. The final value theorem is used to find the
 (A) steady state value of the system output
 (B) initial value of the system output
 (C) transient behaviour of the system output
 (D) none of these
68. Holography is a method of
 (A) analysing graphs (B) measuring thickness
 (C) recording optical images (D) recording voice signals

69. The efficiency of X-Ray machine is about
 (A) 80% (B) 50%
 (C) 2% to 3% (D) 20%
70. A TRIAC is a
 (A) bidirectional gate controlled thyristor (B) combination of two SCRs
 (C) combination of two diodes (D) combination of 3 DIACS
71. He-Ne Lasers have emission power in the order of
 (A) 10 MW (B) 10W
 (C) 1000 MW (D) 1000 W
72. Because they operate in the light region of the frequency spectrum lasers could be called optical
 (A) lenses (B) cavities
 (C) masers (D) capacitors
73. Methods which employ the ultraviolet will have a greater
 (A) accuracy (B) sensitivity
 (C) precision (D) selectivity
74. In a linear demodulation circuit, the time constant of the RC circuit should be
 (A) very high
 (B) very low
 (C) adjusted for lowest modulating frequency
 (D) adjusted for highest modulating frequency
75. A sound pressure of 20 N/m² corresponds to a level of
 (A) 0 dB (B) 120 dB
 (C) 60 dB (D) 20 dB
76. A carrier voltage has peak amplitude of 10 V at frequency of 1×10^6 Hz. A sinusoidal signal of 1 KHz varies with the amplitude of radio frequency wave between 7.5 and 12.5 V. The peak amplitude of the modulating signal is
 (A) 10 V (B) 2.5 V
 (C) 7.5 V (D) 12.5 V
77. A wave of frequency modulated with an index of 0.1 and its frequency is multiplied 8 times, The modulation index is,
 (A) not changed (B) increased four times
 (C) increased eight times to 0.8 (D) decreased eight times to 0.8
78. A RF carrier of 10 KV at 1 MHz is amplitudes modulated and modulation percentage is 50. The peak voltage of the signal is
 (A) 5 KV (B) 500 KV
 (C) 200 V (D) 10 KV
79. In a collector modulated AM amplifier the component that adds the modulating signal to carrier is
 (A) tank circuit (B) modulation choke
 (C) condenser (D) modulation transformer

80. A carrier of 6 KV is amplitude modulated by an audio signal of 4 KV. The modulation index is

- (A) 1.5 (B) 0.667
(C) 1.667 (D) 2.5

81. Which of the following matrices is in reduced row echelon form ?

(A) $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

(B) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 0 \end{bmatrix}$

(D) $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

82. What are the eigen values of the matrix A^T , if $A = \begin{bmatrix} 3 & 0 \\ 4 & 5 \end{bmatrix}$?

- (A) 3, 5 (B) $\frac{1}{3}, \frac{1}{5}$
(C) -3, -5 (D) None of these

83. $\lim_{(x,y) \rightarrow (0,0)} \frac{(x-y)+2\sqrt{x}-2\sqrt{y}}{\sqrt{x}-\sqrt{y}}$ equals _____

- (A) 3 (B) 2
(C) 0 (D) does not exist

84. If $f(x,y) = x^2 + 3xy^2 + y^3 - 1$, then $\frac{\partial^2 f}{\partial x \partial y}$ at the point (1, 2) is _____,

- (A) 0 (B) 14
(C) 20 (D) 12

85. The directional derivative of $f(x,y) = x^2 + y^2$ at point P(1, 1) in the direction of $\vec{a} = 2\hat{i} - 4\hat{j}$ is _____

- (A) $\frac{2}{\sqrt{5}}$ (B) $-\frac{2}{\sqrt{5}}$
(C) $\frac{-2}{5}$ (D) None of these

86. If (0, 0), (±1, 0) (0, ±1) are stationary points of $f(x,y) = 2x^2 - 2y^2 - x^4 + y^4$ then which of the following is true?

- (A) $f(x,y)$ has local maximum Value at (0, 1)
(B) $f(x,y)$ has local maximum value at (0, -1)
(C) $f(x,y)$ has local minimum value at (1, 0)
(D) (0, 0) is a Saddle Point

87. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then $\text{Curl } (\vec{r}) = \underline{\hspace{2cm}}$.
- (A) \vec{r} (B) 0
(C) $\vec{0}$ (D) 3
88. A first order differential equation $M(x,y)dx + N(x,y)dy = 0$ is an exact differential equation, if $\underline{\hspace{2cm}}$.
- (A) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$ (B) $\frac{\partial N}{\partial y} = \frac{\partial M}{\partial x}$
(C) $\frac{\partial M}{\partial y} \neq \frac{\partial N}{\partial x}$ (D) None of these
89. Which of the following differential equation is not a first order linear differential equation ?
- (A) $\frac{dx}{dy} + x \tan y = \cos y$ (B) $x \frac{dy}{dx} + y = x^2 \sin x$
(C) $\frac{dy}{dx} = \frac{y}{x}$ (D) $y^2 \frac{dy}{dx} + y \cos x = \cot x$
90. In usual notation, which of the following equations represents the wave equation ?
- (A) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ (B) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$
(C) $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ (D) $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$
91. A differential equation $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + y = 0$ is a $\underline{\hspace{2cm}}$ equation.
- (A) Bernoulli's (B) Cauchy-Euler
(C) Legendre's (D) Riemann's
92. The Laplace transform of $f(t) = \frac{1}{\sqrt{t}}$ is $\underline{\hspace{2cm}}$.
- (A) $\sqrt{\frac{\pi}{S}}$ (B) $\frac{\sqrt{\pi}}{S}$
(C) $\frac{\pi}{\sqrt{S}}$ (D) none of these
93. Which of the following functions is not analytic?
- (A) $x + iy$ (B) $x + 2iy$
(C) e^{x+iy} (D) $x^2 + 2xyi - y^2$
94. If a function $f(z)$ is analytic and its derivative $f'(z)$ is continuous at each point inside and on a simple closed curve C, then $\oint_C f(z) dz = 0$. This is a statement of $\underline{\hspace{2cm}}$.
- (A) Liouville's theorem (B) Cauchy's integral theorem
(C) Morera's theorem (D) Cauchy's residue theorem

95. In Newton-cotes quadrature formula, if $f(x)$ is interpolated at equally spaced nodes by a polynomial of degree two then it represents _____.
 (A) trapezoidal rule (B) weddle's rule
 (C) simpson's one third rule (D) simposon's three - eighth rule
96. In Newton-Raphson method, we approximate the graph of a function by suitable
 (A) tangent (B) chord
 (C) normal (D) none of these
97. Which of the following methods is one of the predictor - corrector methods to solve first order linear differential equation numerically ?
 (A) Picard's method (B) Runge-kutta fourth order method
 (C) Taylor's Series method (D) Milne's method
98. In which distribution mean, median and mode coincide ?
 (A) poisson (B) normal
 (C) exponential (D) binomial
99. Consider the probability function $P(x) = \frac{6 - |x - 7|}{36}$, $x = 2, 3, 4, \dots, 12$ what is $P(6 < x \leq 8)$?
 (A) $\frac{11}{36}$ (B) $\frac{6}{36}$
 (C) $\frac{5}{36}$ (D) none of these
100. Suppose $P(x=0) = 1 - P(x=1)$. If $E(x) = 3 \text{ var}(x)$, then $P(x=0)$ is _____.
 (A) $\frac{2}{3}$ (B) $\frac{1}{5}$
 (C) $\frac{1}{3}$ (D) none of these

