THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

Ph. D. ENTRANCE TEST (PET) 2023

Signature of Invigilator

Roll. No.

Paper - II
Electrical Engineering

Maximum Marks: 50 **No. Of Printed Pages: 8**

Instruction for the Candidate:

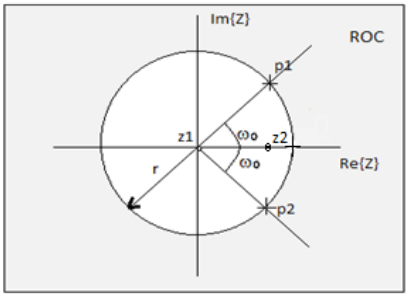
1. This paper consists of **FIFTY (50)** multiple choice type questions. Each Question carries **ONE (1)** mark.
2. There is no Negative Marking for Wrong Answer.
3. A separate OMR Answer Sheet has been provided to answer questions. Your answers will be evaluated based on your response in the OMR Sheet only. No credit will be given for any answering made in question booklet.
4. Defective question booklet or OMR if noticed may immediately replace by the concerned invigilator.
5. Write roll number, subject code, booklet type, category and other information correctly in the OMR Sheet else your OMR Sheet will not be evaluated by machine.
6. Select most appropriate answer to the question and darken appropriate oval on the OMR answer sheet, with black / blue ball pen only. DO NOT USE PENCIL for darkening. In case of over writing on any answer, the same will be treated as invalid. Each question has exactly one correct answer and has four alternative responses (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example: Ⓐ ● Ⓒ Ⓓ where (B) is correct response.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Answer Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, such as change of response by scratching or using white fluid, you will render yourself liable to disqualification.
9. Calculators, Log tables any other calculating devices, mobiles, slide rule, text manuals etc are NOT allowed in the examination hall. If any of above is seized from the candidates during examination time; he/ she will be immediately debarred from the examination and corresponding disciplinary action will be initiated by the Center Supervisor as deemed fit.
10. DO NOT FOLD or TEAR OMR Answer sheet as machine will not be able to recognize torn or folded OMR Answer sheet.
11. **You have to return the OMR Answer Sheet to the invigilator at the end of the examination compulsorily** and must not carry it with you outside the Examination Hall. You are however, allowed to carry original question booklet on conclusion of examination.

Paper - II
Electrical Engineering

Note: This paper contains **FIFTY (50)** multiple-choice questions. Each Question carries **ONE (1)** mark.

01) If $h_{lp}(n)$ denotes impulse response of Low Pass filter with frequency response $H_{lp}(w)$, then a high pass filter can be obtained by following conversion
A) $H_{hp}(w) = H_{lp}(w - \Pi)$
B) $H_{hp}(w) = H_{lp}(w - \Pi/2)$
C) $H_{hp}(w) = - H_{lp}(w + \Pi)$
D) $H_{hp}(w) = -H_{lp}(w + \Pi/2)$

02) Select the statement which is TRUE for the given pole-zero plot with r=1



A) This system has a system function with sinusoidal component
B) This system has real poles
C) It is an unstable system
D) This is a maximum phase filter

03) Supply power factor for single phase half controlled converter using SAC method for firing angle A is
A) COS A
B) 1
C) COS (A/2)
D) Does not depend on A

04) In SRF theory, to reduce current harmonics
A) Only sensing of current is needed
B) Only sensing of Voltage is needed
C) Both is needed
D) Nothing is needed

05) A system is described as $X(z) = \frac{1}{z^M}\sum_{k=0}^{M} b_k z^{M-k}$
A) This is an all zero system
B) This is an all pole system
C) System has both poles and zeros
D) This system function does not convey any information on pole and zero

06) $y(n) = -\sum_{k=1}^{N} a_k\, y(n-k) + \sum_{k=1}^{M} b_k\, x(n-k)$;

Given that N>M
A) Order of this system is M
B) Order of this system is N
C) Order of this system is N-M
D) Order of this system is N+M

07) What will be the voltage drop across the source resistance of differential amplifier when connected in open loop configuration?
A) Infinity
B) Zero
C) One
D) Greater than one

08) A system is described as:

$$X(z) = Gz^{N-M}\,\frac{\prod_{k=1}^{M}(z - z_k)}{\prod_{k=1}^{N}(z - p_k)}$$

This system has
A) M number of zeros and N number of poles
B) N number of zeros and N-M number of poles
C) N-M number of zeros and M number of poles
D) N number of zeros and M number of poles

09) Minimum order of supply current harmonics present in 12 pulse converter is
A) 12n ±1
B) 6n ±1
C) 12n
D) 6n

10) The transfer function of two filters are given respectively as:
$H_1(z) = \frac{z+b}{z+a}$, $H_2(z) = \frac{bz+1}{z+a}$; where $|a| < 1$ and $|b| < 1$.

It is given that both are stable filters. In the context, which of the following statement is TRUE?
A) Both the filters have identical magnitudes and identical phases
B) Both the filters have identical magnitudes but different phases
C) Both the filters have different magnitudes but identical phases
D) Both the filters have different magnitudes and different phases

11) In AC voltage controllers the
A) variable ac with fixed frequency is obtained
B) variable ac with variable frequency is obtained
C) variable dc with fixed frequency is obtained
D) variable dc with variable frequency is obtained

12) A system is described as $X(z) = \frac{1}{1-az^{-1}}$; ROC: $|z| > |a|$.

A) This system has only one zero and no pole
B) This system has only one pole and no zero
C) This system neither has pole nor has zero
D) This system has one pole and one zero

13) Zero initial condition for a system means
   A) input reference signal is zero
   B) the output of the system is zero
   C) no initial movement of moving parts
   D) system is at rest and no energy is stored in any of its components

14) What is the full form of SPI Bus ?
   A) Sequence Peripheral Interconnection
   B) Serial Peripheral Interconnection
   C) Serial Peripheral Interface
   D) Sequence Peripheral Interface

15) A system described as y[n]=y[n-1]+x[n] is a
   A) First order recursive system
   B) First order nonrecursive system
   C) First order FIR system
   D) (n-1)th order recursive system

16) A semiconductor has …… temperature coefficient of resistance.
   A) Positive
   B) Negative
   C) Zero
   D) None of the above

17) Addition of zeros in transfer function causes which of the following?
   A) Lead-compensation
   B) Lag-compensation
   C) Lead-lag compensation
   D) None of the above

18) In context of Satellite communication, carrier-to-noise-ratio is denoted as $CNR=\frac{P_c}{N_o B}$. Here P_c is average carrier power, N_0 is power spectral density of noise and B is _____
   A) Boltzmann's constant
   B) Beamwidth
   C) effective noise bandwidth
   D) modulated signal (radio frequency) bandwidth

19) If circular convolution is performed between two sequences x[n] and y[n] and each of them is of length four, then what would be the length of the (convolved) resultant sequence?
   A) 4
   B) 8
   C) 16
   D) length depends upon number of nonzero element in both the sequences

20) Excessive bandwidth in control systems should be avoided because,
   A) It leads to slow speed of response
   B) It leads to low relative stability
   C) Noise increases in proportion to the bandwidth
   D) None of the above

21) In a TDMA frame *overhead* consists of,
   A) Traffic bits
   B) Preamble and reference burst
   C) Guard time
   D) Noise

22) In closed loop control system, with positive value of feedback gain, the overall gain of the system will
   A) decrease
   B) increase
   C) remains unaffected
   D) None of the above

23) How many bytes of storage will be assigned to the following variable on the 32 bit Hardware platform?

Code : unsigned short int i;
unsigned int j;

   A) i - 2 bytes j - 3 bytes
   B) i - 1 byte j - 2 bytes
   C) i - 2 bytes j - 4 bytes
   D) none of the above

24) What should a programmer use to avoid his Program getting hanged during execution?
   A) Watch Dog Timer
   B) Timer
   C) introduce more While(1)
   D) Brown out Detection

25) A cylindrical rotor generator delivers 0.5 pu power in the steady-state to an infinite bus through a transmission line of reactance 0.5 pu. The generator no-load voltage is 1.5 pu and the infinite bus voltage is 1 pu. The inertia constant of the generator is 5 MW-s/MVA and the generator reactance is 1 pu. The critical clearing angle, in degrees, for a three-phase dead short circuit fault at the generator terminal is
   A) 53.5
   B) 60.2
   C) 70.8
   D) 79.6

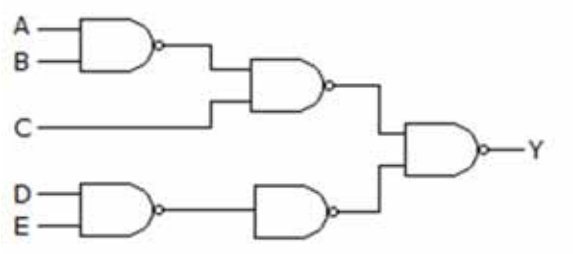
26) Which circuit is known as free running multivibrator
   A) Mono stable multivibrator
   B) Astable Multivibrator
   C) Bistable Multivibrator
   D) None of Above

27) Output of OPAMP is _____in open loop configuration
   A) Same as Input
   B) Inverted of Input
   C) Either positive saturation or Negative saturation
   D) None of above

28) A source $v_s(t) = V \cos 100\pi t$ has an internal impedance of $(4 + j3)\Omega$. If a purely resistive load connected to this source has to extract the maximum power out of the source, its value in Ω should be
   A) 3
   B) 4
   C) 5
   D) 7

29) What is the application of Brown out detector?
   A) it reduces noise in the port pins
   B) it is not accessible to the user.
   C) it will reset the Chip when low voltage happen on supply pin
   D) None of the above.

30) The circuit of the given figure realizes the function ……



   A) $Y = (\overline{A} + \overline{B})\,C + \overline{DE}$
   B) $Y = \overline{A} + \overline{B} + \overline{C} + \overline{D} + \overline{E}$
   C) $AB + C(D + E)$
   D) $AB + C + DE$

31) A Bode plot of a single real pole decreases at the rate -20dB/decade at high frequencies. What would be the equivalent value of X, if this slop is represented as XdB/octave?
   A) -120
   B) -12
   C) -6
   D) -3

32) Which method from the following should be used to reduce interrupt latency in the Embedded system?
   A) ISR routine Should have minimum instructions
   B) ISR routine Should have more Calculation instructions & Fewer Logical instructions
   C) ISR routine Should have more Logical instructions and Fewer Calculation instructions
   D) a & c both

33) The characteristic equation of a control system is given by $s(s+4)(s^2+2s+1) + k(s+1) = 0$. What are the angles of the asymptotes for the root loci?
   A) 0°, 180°, 300°
   B) 0°, 120°, 240°
   C) 60°, 180°, 300°
   D) 120°, 180°, 240°

34) The sequence components of the fault current are as follows:

$I_{positive} = j1.5$ pu, $I_{negative} = -j0.5$ pu, $I_{zero} = -j1$ pu.

The type of fault in the system is
   A) LG
   B) LL
   C) LLG
   D) LLLG

35) For a power system network with n nodes, Z_{33} of its bus impedance matrix is j0.5 per unit. The voltage at node 3 is $1.3 \angle -10°$ per unit. If a capacitor having reactance of –j3.5 per unit is now added to the network between node 3 and the reference node, the current drawn by the capacitor per unit is
   A) $0.325 \angle -100°$
   B) $0.325 \angle 80°$
   C) $0.371 \angle -100°$
   D) $0.433 \angle 80°$

36) The purpose for providing ample straight-pipe lengths before and after a flowmeter is to:
   A) Dampen pipe vibrations generated near elbows
   B) Stabilize the flow profile within the flowmeter
   C) Amplify the Coriolis effect for better rangeability
   D) Prevent cavitation

37) Minimize choking under high-flow conditions

A shaft encoder attached to a dc motor has a sensitivity of 500 pulses per revolution. A frequency meter connected to the output of the encoder indicates the frequency to be 5500 Hz. The speed of the motor in rpm is
   A) 110
   B) 220
   C) 550
   D) 660

38) To reduce the effect of fringing in a capacitive type transducer
   A) The transducer is shielded and the shield is kept at ground potential
   B) A guard ring is provided and it is kept at ground potential
   C) The transducer is shielded and the shield is kept at the same potential as the moving plate
   D) A guard ring is provided and it is kept at the same potential as the moving plate

39) A pressure gauge used to measure vacuum indicates a gauge pressure of 5 kPa. the atmospheric pressure is 100 kPa, the absolute pressure is
   A) 105 kPa
   B) 0.05 kPa
   C) 95 kPa
   D) 20 kPa

40) Why is damping of a ballistic galvanometer kept small?
   A) To get minimum overshoot
   B) To make the system critically damped
   C) To make the system oscillatory
   D) To get first deflection large.

41) A three-phase, 33kV oil circuit breaker is rated 1200 A, 2000 MVA, 3s. The symmetrical breaking current is
   A) 1200 A
   B) 3600 A
   C) 35 kA
   D) 104.8 kA

42) The slope of a.c. load line is …… that of d.c. load line
   A) The same as
   B) More than
   C) Less than
   D) None of the above

43) When a multistage amplifier is used to amplify d.c. signal, then one must use …….. coupling
   A) RC
   B) Transformer
   C) Direct
   D) None of the above

44) Which functional mode enables the BJT to act as an open switch under the application of zero input control signal?
   A) BE junction only in forward biased mode
   B) BE junction only in reversed biased mode
   C) BE junction in forward as well as reversed biased mode
   D) None of the above

45) If cut off frequency is 200 Hertz, what is the minimum frequency with stiff coupling?
   A) 2000 Hertz
   B) 200 Hertz
   C) 20 Hertz
   D) 2 Hertz

46) For three cascaded stages, each with a bandwidth of 10 KHz, overall bandwidth would be
   A) 5 KHz
   B) 5.1 KHz
   C) 6 KHz
   D) 6.1 KHz

47) Consider the following two statements:
   I. The maximum number of linearly independent column vectors of a matrix A is called the rank of A.
   II. If A is an n x n square matrix, it will be nonsingular if rank A = n.
   With reference to the above statements, which of the following applies?

   A) Both the statements are false
   B) Both the statements are true
   C) I is true but II is false.
   D) I is false but II is true.

48) In a seven layer OSI model, sixth layer is
   A) Session layer
   B) Application layer
   C) Data link layer
   D) Presentation layer

49) Volume of the cylinder $x^2 + y^2 = a^2$ bounded below by z=0 and bounded above by z=h is given by
   A) πah
   B) $\pi a^2 h$
   C) $1/3\ \pi a^3 h$
   D) None of these

50) The inverse of – i in the multiplicative group, {1, -1, i , - i} is
   A) 1
   B) -1
   C) i
   D) -i

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Rough Work: