

THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

Ph. D. ENTRANCE TEST (PET) – 7<sup>th</sup> August 2022

Signature of Invigilator

Paper - II  
Electrical Engineering  
(22/37)

Roll.  
No.

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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:** (A) (●) (C) (D) 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 (22/37)**

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- 01) If  $V_o$  is the output voltage across load and  $V_s$  is the input DC voltage, then for the below given circuit
- A)  $V_o = V_s$
  - B)  $V_o < V_s$
  - C)  $V_o > V_s$
  - D) Insufficient information
- 02) In the PWM of control of output voltage of Inverter
- A) external commutating capacitors are required
  - B) more average output voltage can be obtained
  - C) lower order harmonics are minimized
  - D) higher order harmonics are minimized
- 03) The V-I characteristics for a triac in the first and third quadrants are essentially identical to those of ..... in its first quadrant
- A) Transistor
  - B) SCR
  - C) UJT
  - D) none of the above
- 04) Supply power factor in single phase semi converter for firing angle  $A$  is
- A)

- 13) Multiplexer Circuits has
- Many inputs and one output
  - One input and many out put
  - Many input and Many output
  - None of Above
- 14) Which gates are known as universal gates?
- AND and OR
  - NAND and EX OR
  - NOR and NAND
  - OR and EXNOR
- 15) What is the file extension used to load in microcontroller to execute an instructions
- .c
  - .txt
  - .doc
  - .hex
- 16) Which of the following is true about microprocessors?
- It has an internal memory
  - It has interfacing circuits
  - It contains ALU, CU, and registers
  - It uses Harvard architecture
- 17) How many flags in a flag register of 8085 microprocessor?
- 2
  - 5
  - 8
  - 16
- 18) JZ, DJNZ, JC, JNC instructions monitor a bit of which register in 8051 ?
- DPTR
  - A
  - PSW
  - B
- 19) Bandwidth of modulating signal is 7.5 kHz and peak frequency deviation is 100 kHz, then the bandwidth occupied by the Frequency Modulated signal would be
- 107.5 kHz
  - 92.5 kHz
  - 215 kHz
  - 100kHz
- 20) Number of non zero elements in sequence  $x[n]$  is  $N_1$ , number of non zero elements in sequence  $y[n]$  is  $N_2$ . If one applies linear convolution  $x[n]$  and  $y[n]$ , how many non zero elements will occur in the resultant sequence?
- $N_1+N_2$
  - $N_1-N_2$
  - $N_1-N_2+1$
  - $N_1+N_2-1$

- 21) If signal fulfills the following condition :

$$0 < \lim_{T \rightarrow \infty} \frac{1}{T} \int_0^T |x(t)|^2 dt < \infty, \text{ then}$$

it is a

- Power signal
  - Energy signal
  - Both Power and Energy signal
  - None of the above
- 22) In the equation  $P=kTB$ ,  $k$  is Boltzmann's constant, here variable  $P$  indicates
- Power output of a radar with beamwidth  $B$  with temperature  $T$  (deg K)
  - Maximum noise power the source can deliver in bandwidth  $B$  with temperature  $T$  (deg K)
  - Output power of an antenna with bandwidth  $B$  with temperature  $T$  (deg K)
  - Probability of error in time interval  $T$  and bandwidth  $B$
- 23) A system is described as:
- $$H(z) = \frac{z^2 + 1}{z^2 - 1}$$
- This system has
- $M$  number of zeros and  $N$  number of poles
  - $N$  number of zeros and  $N-M$  number of poles
  - $N-M$  number of zeros and  $M$  number of poles
  - $N$  number of zeros and  $M$  number of poles
- 24) A system is given as:
- $$H(z) = \frac{z^2 + 1}{z^2 - 1}$$
- . This is a representation of
- FIR filter in frequency domain
  - IIR filter in time domain
  - FIR filter in time domain
  - IIR filter in frequency domain
- 25) A system in  $z$ -domain is represented as follows:
- $$Y(z) = X(z) - z^{-1}Y(z)$$
- . What form will it take in time domain?
- $x[n] = y[n] - y[n-1]$ .
  - $n \cdot x[n] = y[n] - y[n-1]$ .
  - $x[n] = y[n] - (n-1)y[n]$ .
  - $n \cdot x[n] = ny[n] - y[n-1]$ .
- 26) In a seven layer OSI model, sixth layer is
- Session layer
  - Application layer
  - Data link layer
  - Presentation layer

- 27) Music CDs employ uniform quantization. The sampling frequency is 44,100 samples/sec. Each sample is then quantized using 16 bits. Calculate the encoding rate of music on CDs
- 88200bps
  - 705600bps
  - 325800bps
  - 44100bps
- 28) Impulse response of a system is given as  $h(n) = (a)^n \cdot u(n)$ . For the system to remain stable following condition should be fulfilled
- - 
  - 
  - $-1 < a < 1$
- 29) A system has two poles on  $z = -1$
- This system is stable
  - This system is unstable
  - This system is marginally stable
  - Information is not sufficient to comment on stability
- 30) Breakdown voltage of gaseous dielectric is lower if.....
- humidity is higher
  - pressure is higher
  - radiation is lower
  - temperature is lower
- 31) Partial discharge can be higher if ..... is higher.
- resistivity of crack
  - pressure of the crack
  - inner surface microprotrusion
  - dielectric strength of the crack
- 32) A 3-phase , 200 KVA, 11 KV/400V transformer is connected in delta-star . The CTs on LV side have turns ratio of 500/5. Proposed scheme of protection will be ..... and the circulating current through relay will be ..... when the fault of 750 A of earth fault within the protective zone occur on the LV side.
- differential relaying, 32.99 A
  - overcurrent relaying, 21.99 A
  - differential protection, 12.99 A
  - differential protection, 21.99 A
- 33) A 11 KV/132 KV power transformer is connected in delta-star. The CTs on low voltage side have turns ratio of 600/5. The suitable turns ratio for CTs on high voltage side will be .....
- 17.32 :1
  - 73.21:1
  - 500.21:1
  - 7321:1
- 34) Identify the major factor for determining whether a medium is free space, lossless dielectric, lossy dielectric, or good conductor
- - Loss tangent
  - Attenuation constant
  - Reflection coefficient
- 35) A microwave frequencies, we prefer waveguides to transmission lines for transporting EM energy because of all the following except that
- Losses in transmission lines are prohibitively large.
  - Transmission lines are larger in size than waveguides.
  - Waveguides have larger bandwidths and lower signal attenuation.
  - Transmission lines only support TEM mode.
- 36) The dimensions for resistance and inductance in MLTI system will be..... & ..... respectively, where M=Mass, L=Length, T= Time and I= Current
- $M^1L^2T^{-2}I^{-2}$  ;  $M^1L^2T^{-3}I^{-2}$
  - $M^1L^0T^{-2}I^0$  ;  $M^1L^2T^{-3}I^{-2}$
  - $M^1L^2T^{-2}I^{-2}$  ;  $M^1L^2T^0I^0$
  - $M^1L^2T^{-3}I^{-2}$  ;  $M^1L^2T^{-2}I^{-2}$
- 37) A resistance of approximate value of 80 ohm is to be measured by voltmeter-ammeter method using a 1 A ammeter having a resistance of 2 ohm and a 50 V voltmeter having a resistance of 5000 ohm. Identify the correct method which gives less error and if in the suggested method the following measurements are made :  $I = 0.42$  A and  $V = 35.5$  V. .... will be the resulting error in the ammeter reading if the accuracy of the instruments is  $\pm 0.5$  % at full scale and the errors are standard deviations.
- 9.19%
  - 1.19%
  - 0%
  - 7.81%

38) A generating station has a maximum demand of 25 MW, a load factor of 60%, a plant capacity factor of 50% and a plant use factor of 72%. The reserve capacity of the plant is..... MW

- A) 20
- B) 15
- C) 10
- D) 5

39) A 100 MW steam power station uses coal of calorific value of 6400 kcal/kg. Thermal efficiency of the station is 30% while electrical efficiency is 92%. Calculate the coal consumption per hour when the station is delivering its full output.

- A) 48.6 metric ton
- B) 68.4 metric ton
- C) 100.68 metric ton
- D) 600.98 metric ton

40) A 50-kva 550-volt single-phase alternator has an open-circuit emf of 300 volts when the field current is 14 amp. When the alternator is short-circuited through an ammeter, the armature current is 160 amp, the field current still being 14 amp. The ohmic resistance of the armature between terminals is 0.16 ohm. The ratio of effective to ohmic resistance may be taken as 1.2. Determine regulation at 0.8 power factor, current lagging.

- A) 23.10%
- B) 32.10%
- C) 13.10%
- D) 8%

41) A 4,400-volt 60-cycle transformer has core loss of 840 watts, of which one-third is eddy-current loss. Determine the core loss when the transformer is connected to a 4,600-volt 50-cycle source.

- A) 780 W
- B) 870 W
- C) 78 W
- D) None of these

42) Consider the following statements:

- 1) A system is said to be stable if its output is bounded for any input
- 2) A system is stable if all the roots of the characteristics equation lie in the left half of the s-plane
- 3) A system is stable if all the roots of the characteristics equation have negative real parts
- 4) A second order system is always stable for finite positive values of open loop gain.

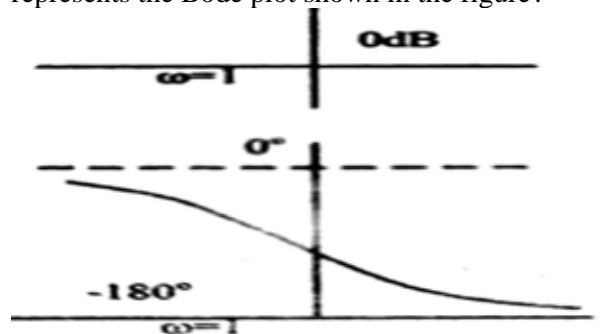
Which of the above statements is/are wrong?

- A) 2,3 and 4
- B) 1 only
- C) 3 only
- D) 3 and 4 only

43) A unity-feedback control system to guide a laser beam to mark a parabolic path on a metal sheet has a forward path transfer function . The open-loop gain needed to yield final accuracy of 5 mm for an input of cm is

- A) 1
- B) 2
- C) 4
- D) 8

44) Which one of the following transfer functions represents the Bode plot shown in the figure?



- A)  $G = \frac{1}{s}$
- B)  $G = \frac{1}{s^2}$
- C)  $G = s$
- D)  $G = s^2$

45) The transfer function of a linear time invariant system is  $G(S) = \frac{1}{s^2 + 2s + 1}$ . The steady state value of the output of the system for a unit impulse input applied at time instant  $t=1$  will be

- A) 0
- B) 0.5
- C) 1
- D) 2

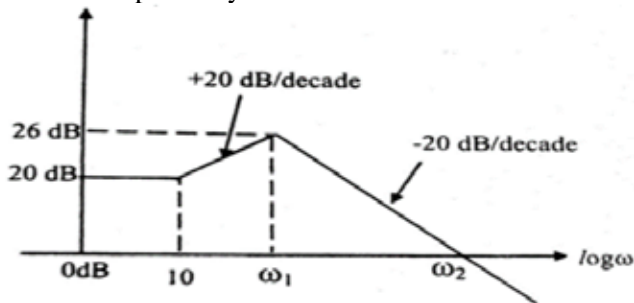
46) An uncompensated system poses the following fundamental tradeoffs:

- a) Between accuracy and relative stability
  - b) Between speed of response and relative stability
- In this context which of the following is/are correct?

- i. A PI controller can resolve (a) but not (b)
- ii. A PD controller can resolve (b) but not (a)
- iii. A P controller cannot resolve any of these tradeoffs
- iv. A PD controller can resolve (a) but not (b)

- A) i & ii,
- B) ii & iii,
- C) iii & iv,
- D) ii

47) The magnitude-frequency response of a control system is shown in the figure. The value of  $\omega_1$  and  $\omega_2$  are respectively



- A) 10 and 200
- B) 20 and 200
- C) 20 and 400
- D) 100 and 4000

48) The area bounded by the parabola  $2y=x^2$  and the line  $x=y-4$  is equal to

- A) 6
- B) 18
- C) Infinite
- D) None of these

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)
- B)  $2h$
- C)  $3h$
- D) None of these

50) For a control system having transfer function  $\frac{1}{s^2 + 2s + 1}$ , given a step command

- A) Both the natural and the forced responses would have one term each
- B) Both the natural and the forced responses would have two terms each
- C) Two terms for the natural response and none for the forced response
- D) Two terms for natural response and one for the forced response

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**Rough Work:**