

Name of Post:	Junior Manager (Electrical/Mechanical/IT/Instrumentation) in Assam Power Generation Corporation Limited (APGCL)
Advt. No.	12/2023 dated 25.04.2023
Date of Exam.	03.12.2023

**JM/APGCL/INS/23**

**RE ASKED TO DO SO**

**Test Booklet No. :**

00205

**TEST BOOKLET**  
**Paper—I**  
**( INSTRUMENTATION )**

**Series**



**Time Allowed : 2 Hours**

**Full Marks : 100**

**Read the following instructions carefully before you begin to answer the questions :**

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. **Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.**
3. All questions carry equal marks.

**The Answer-Sheet should be submitted to the Invigilator.**

*Directions for giving the answers :* Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

*Example :*

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :



In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :



**The example shown above is the only correct method of answering.**

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (20) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

**N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.**

**/9-A**

**[ No. of Questions : 100 ]**

**SEAL**

1. The principle of superposition theorem includes two of the most important properties : homogeneity and additivity. The principles of additivity and homogeneity are applied to
- (A) linear time-variant systems
  - (B) non-linear time-variant systems
  - (C) linear and bilateral elements
  - (D) non-linear time-invariant systems

2. The positive terminal of a 6 V battery is connected to the negative terminal of a 12 V battery whose positive terminal is grounded. The potential of the negative terminal of the 6 V battery is
- (A) +18 V
  - (B) -12 V
  - (C) -18 V
  - (D) +12 V

3. The total resistance between points A and B as shown in Fig. 1 is

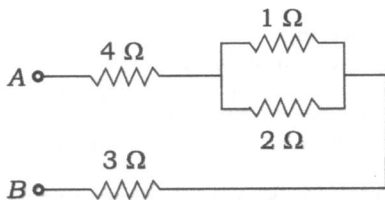


Fig. 1

- (A) 7 Ω
- (B) 0 Ω
- (C) 7.67 Ω
- (D) 0.48 Ω

4. Thevenin's resistance is found by
- (A) shorting all voltage sources
  - (B) opening all current sources
  - (C) shorting all voltage sources and opening all current sources
  - (D) opening all voltage sources and shorting all current sources

5. A 12 V source with an internal resistance of  $1.2 \Omega$  is connected across a wire-wound resistor. The maximum power will be dissipated in the resistor when its resistance is equal to
- (A) zero
  - (B)  $1.2 \Omega$
  - (C)  $12 \Omega$
  - (D)  $\infty$  (infinity)

6. The theorem applicable to any network, linear or non-linear, active or passive, time-varying or invariant, as long as Kirchoff's laws are **not** violated, is

- (A) Tellegen's theorem
- (B) reciprocity theorem
- (C) maximum power transfer theorem
- (D) superposition theorem

7. The mesh currents  $I_1$  and  $I_2$  flowing in the first and second meshes in Fig. 2 respectively are

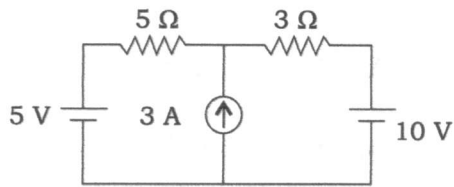


Fig. 2

- (A) 1.75 A, 1.25 A  
 (B) 0.5 A, 2.5 A  
 (C) 2.3 A, 0.3 A  
 (D) 3.2 A, 6.5 A
8. A cylindrical wire, 1 m in length, has a resistance of 100  $\Omega$ . What would be the resistance of a wire made from the same material if both the length and the cross-sectional area are doubled?
- (A) 200  $\Omega$   
 (B) 400  $\Omega$   
 (C) 100  $\Omega$   
 (D) 50  $\Omega$
9. Assuming zero initial condition, the response  $y(t)$  of the system given in Fig. 3 to a unit-step input  $u(t)$  is

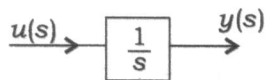


Fig. 3

- (A)  $u(t)$   
 (B)  $tu(t)$   
 (C)  $\frac{t^2}{2} u(t)$   
 (D)  $e^{-t}u(t)$

10. A ramp voltage  $v(t) = 100t$  V is applied to an  $R$ - $C$  differentiating circuit with  $R = 5$  k $\Omega$  and  $C = 4$   $\mu$ F. The maximum output voltage is

- (A) 0.2 V  
 (B) 2 V  
 (C) 10 V  
 (D) 50 V

11. The following figure (Fig. 4) shows a series  $R$ - $C$  circuit where the voltage across  $C$  starts increasing when the DC source is switched on. At the instant of closing the switch (at  $t = 0^+$ ), the rate of increase of voltage across  $C$  will be

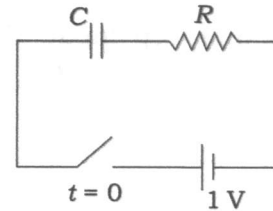


Fig. 4

- (A) zero  
 (B) infinity  
 (C)  $RC$   
 (D)  $1/RC$

12. Two two-port networks are connected in cascade. The combination is to represent as a single two-port network. The parameters of the network are obtained by multiplying the individual

- (A)  $z$ -parameter matrix  
 (B)  $h$ -parameter matrix  
 (C)  $y$ -parameter matrix  
 (D)  $ABCD$ -parameter matrix

13. An  $R$ - $C$  coupling circuit is an example of a type of filter known as
- (A) low-pass filter
  - (B) high-pass filter
  - (C) band-pass filter
  - (D) all-pass filter

14. Consider the control system shown in Fig. 5 below :

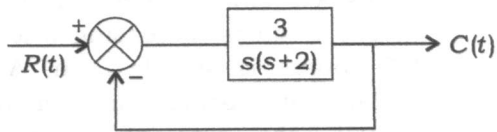


Fig. 5

For unit-step input, the instant at which output takes a maximum value is

- (A)  $\pi$
  - (B)  $\pi/2$
  - (C)  $\pi/\sqrt{2}$
  - (D)  $\pi/\sqrt{3}$
15. Out of the systems given below, which has faster unit-step response?
- (A)  $\frac{1}{1+5s}$
  - (B)  $\frac{1}{1+2s}$
  - (C)  $\frac{1}{1+3s}$
  - (D)  $\frac{1}{3+8s}$

16. The forward path transfer function is given by  $G(s) = 2/s(s+3)$ . The expression for unit-step response of the system will be

- (A)  $1 + 2e^{-t} + e^{-2t}$
- (B)  $1 + e^{-t} - 2e^{-2t}$
- (C)  $1 - e^{-t} + 2e^{-2t}$
- (D)  $1 - 2e^{-t} + e^{+2t}$

17. The convolution of a step signal is 49 times that is 49 convolution operations. The Laplace transform is

- (A)  $1/s^{49}$
- (B)  $1/s^{50}$
- (C) 1
- (D)  $s^{49}$

18. Inverse Laplace of the function

$$\frac{s}{s^2 + 3s + 2}$$

is

- (A)  $-e^{-t} + 2e^{-2t}$
- (B)  $e^{-t} - 2e^{-2t}$
- (C)  $e^{-t} + 2e^{-2t}$
- (D)  $2e^{-t} + 2e^{-2t}$

19. A system has high gain and phase margins. The system is

- (A) very stable
- (B) sluggish
- (C) very stable and sluggish
- (D) oscillatory

20. The computation of  $XR(k)$  for a complex-valued  $x(n)$  of  $N$  points requires

- (A)  $2N^2$  evaluations of trigonometric functions
- (B)  $4N^2$  real multiplications
- (C)  $4N(N-1)$  real additions
- (D) All of the above

21. The Bode plot of a transfer function  $G(s)$  is shown in Fig. 6 below. The gain are 32 dB and -8 dB at 1 rad/s and 10 rad/s respectively. The phase is negative for all  $\omega$ . Then  $G(s)$  is

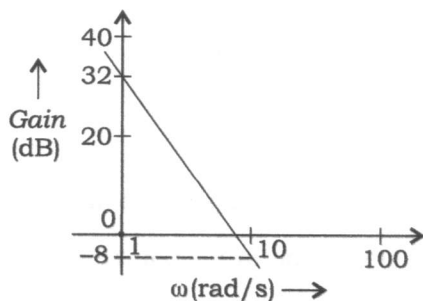


Fig. 6

- (A)  $39.8/s$
- (B)  $39.8/s^2$
- (C)  $32/s^2$
- (D)  $32/s$

22. The transfer function

$$G_C = \frac{5(s+2.9)(s+0.1)}{(s+5.4)(s+0.03)}$$

can be for

- (A) lead compensator
- (B) lag compensator
- (C) lead-lag compensator
- (D) Either (A) or (B)

23. If zero appears in the first column of Routh table, the system is

- (A) necessarily stable
- (B) necessarily unstable
- (C) marginally stable
- (D) None of the above

24. The breakaway point of root locus occurs at

- (A) imaginary axis
- (B) real axis
- (C) multiple roots of characteristic equation
- (D) Either (A) or (B)

25. The impulse response of an  $R-L$  circuit is

- (A) parabolic function
- (B) step function
- (C) rising exponential function
- (D) decaying exponential function

26. The pole-zero configuration of a system has been shown in Fig. 7. The system represents a

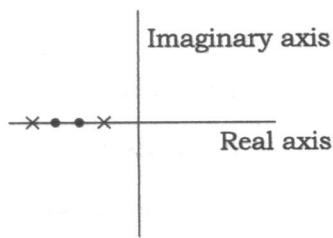


Fig. 7

- (A) PID controller  
 (B) lag-lead compensating network  
 (C) PD controller  
 (D) None of the above
27. Look at the following plot in Fig. 8 and indicate the correct option for the type and order of the given Nyquist plot :

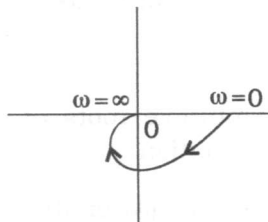


Fig. 8

- (A) 1, 2  
 (B) 0, 1  
 (C) 2, 1  
 (D) 0, 2

28. With the introduction of PI controller in a control system, pick the correct effect produced.

- (A) Rise time does not change  
 (B) Steady-state error increases  
 (C) Overshoot increases  
 (D) None of the above

29. If the input AC is 10 V rms, the maximum voltage that will appear across the diode of an HWR (half-wave rectifier) with a capacitor filter is

- (A) 10 V  
 (B) 14 V  
 (C) 28 V  
 (D) 20 V

30. Which of the following has the least power dissipation?

- (A) TTL  
 (B) ECL  
 (C) Schottky  
 (D) CMOS

31. What is quiescent point or Q-point?

- (A) Operating point of device  
 (B) The point at which device has maximum functionality  
 (C) The point at which current is equal to zero  
 (D) The point of V-I graph where slope is 0.5

32. Ripple factor determines how well an HWR can convert AC voltage to DC voltage. Ripple factor of an HWR is

- (A) 1.414
- (B) 1.21
- (C) 1.3
- (D) 0.48

33. Which amplifier circuit can be used as a current buffer circuit?

- (A) CE
- (B) CB
- (C) CC
- (D) None of the above

34. Thermal runaway is **not** possible in FET because as the temperature of FET increases

- (A) the mobility decreases
- (B) the transconductance increases
- (C) the drain current increases
- (D) the mobility increases

35. Consider the following statements :

*P* : JFET is biased to operate in active region.

*Q* : MOSFET is biased to operate in saturation region.

Select the correct answer.

- (A) Both *P* and *Q* are correct
- (B) *P* is correct and *Q* is incorrect
- (C) *P* is incorrect and *Q* is correct
- (D) Both *P* and *Q* are incorrect

36. For the circuit shown in Fig. 9, assume ideal diodes with zero forward resistance and zero forward voltage drop. The current through the diode  $D_2$  in mA is

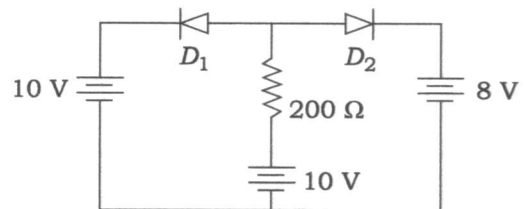


Fig. 9

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

37. For an OPAMP shown in Fig. 10, the bias currents are  $I_{b1} = 450 \text{ nA}$  and  $I_{b2} = 350 \text{ nA}$ . The values of the input bias current ( $I_b$ ) and the input offset current ( $I_f$ ) are

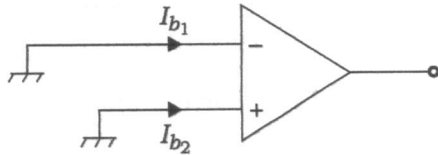


Fig. 10

- (A)  $I_b = 800 \text{ nA}$ ,  $I_f = 50 \text{ nA}$   
 (B)  $I_b = 800 \text{ nA}$ ,  $I_f = 100 \text{ nA}$   
 (C)  $I_b = 400 \text{ nA}$ ,  $I_f = 50 \text{ nA}$   
 (D)  $I_b = 400 \text{ nA}$ ,  $I_f = 100 \text{ nA}$
38. In the circuit of Fig. 11, assume that the transistor is in active region. It has a large  $\beta$  and base-emitter voltage  $V_{BE} = 0.7 \text{ V}$ . The value of  $I_C$  is

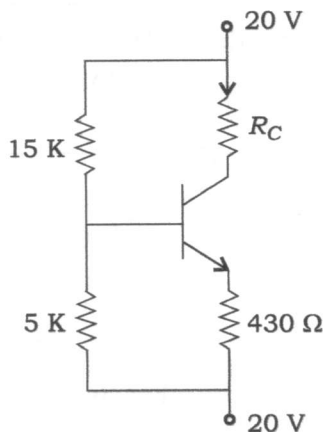


Fig. 11

- (A) indeterminate since  $R_C$  is not given  
 (B) 1 mA  
 (C) 5 mA  
 (D) 10 mA

39. The 3 dB cut-off frequency of a DC amplifier is 5 MHz. Its rise time is

- (A) 350 ns  
 (B) 200 ns  
 (C) 70 ns  
 (D) 35 ns

40. For generating a 1 kHz, the most suitable circuit is

- (A) Hartley oscillator  
 (B) Colpitts oscillator  
 (C) tuned collector oscillator  
 (D) Wien bridge oscillator

41. Gain stability of an amplifier can be improved by

- (A) positive feedback  
 (B) negative feedback  
 (C) Both (A) and (B)  
 (D) Both have no effect

42. With four Boolean variables, how many Boolean expressions can be formed?

- (A) 16  
 (B) 256  
 (C) 1024  
 (D) 64 K



43. The value of the binary subtraction of  $101001 - 010110$  will be equal to

- (A) 010011
- (B) 100110
- (C) 011001
- (D) 010010

44. Which of the following hexadecimal numbers is equivalent to  $(1E.43)_{16}$ ?

- (A)  $(36.508)_8$
- (B)  $(36.206)_8$
- (C)  $(35.506)_8$
- (D)  $(35.206)_8$

45. 1's complement for the binary number 10110 is

- (A) 01001
- (B) 10001
- (C) 01100
- (D) 01110

46. The following gate in Fig. 12 represents

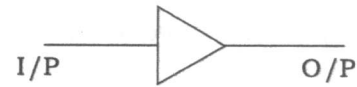


Fig. 12

- (A) AND
- (B) NOT
- (C) Buffer
- (D) Not a gate

47. The resolution of an analog-to-digital converter with a word length of 8 bits and an analog signal input range of 10 V is

- (A) 39.2 mV
- (B) 625 mV
- (C) 1.25 V
- (D) 5 V

48. Interrupt system of 8255 port PB is enabled by set of

- (A) PC6
- (B) PC4
- (C) PC2
- (D) EII instruction

49. Clock out signal of 8085 is at a frequency equal to
- (A) crystal frequency
  - (B)  $\frac{1}{2}$  (crystal frequency)
  - (C)  $\frac{1}{3}$  (crystal frequency)
  - (D) double of crystal frequency
50. Most of the operations inside 8085 microprocessor
- (A) are triggered at clock high
  - (B) are triggered at clock low
  - (C) are triggered during transitions
  - (D) does not depend on any clock signal
51. The TRAP interrupt mechanism of the 8085 microprocessor executes
- (A) RST by hardware
  - (B) NOP
  - (C) instruction from memory location 20H
  - (D) instruction supplied by external device through the INTA signal
52. A  $J-K$  flip-flop happens to be toggled when both inputs  $J$  and  $K$  are having some specific values where the present state is equal to the previous state and gets complemented. In the toggle mode, a  $J-K$  flip-flop has
- (A)  $J = 0, K = 1$
  - (B)  $J = 1, K = 1$
  - (C)  $J = 0, K = 0$
  - (D)  $J = 1, K = 0$
53. An AC current given by  $i = 14.14 \sin\left(\omega t + \frac{\pi}{6}\right)$  has an r.m.s value and phase of
- (A) 10 A,  $30^\circ$
  - (B) 14.14 A,  $-30^\circ$
  - (C) 1.96 A,  $180^\circ$
  - (D) 7.07 A,  $70^\circ$
54. The power factor of a series  $R-L-C$  circuit at its half-power point is
- (A) unity
  - (B) lagging
  - (C) leading
  - (D) Either (A) or (B)

55. The power factor of an ordinary electric bulb is
- (A) zero
- (B) unity
- (C) slightly more than zero
- (D) slightly less than unity
56. The impedances of two parallel branches of a circuit are  $(10 + j10)$  and  $(10 - j10)$  respectively. The impedance of the parallel combination is
- (A)  $20 + j0$
- (B)  $10 + j0$
- (C)  $5 - j5$
- (D)  $0 - j20$
57. A parallel resonant circuit can be used
- (A) to amplify certain frequencies
- (B) to reject a small band of frequencies
- (C) as a high impedance
- (D) Both (B) and (C)
58. A circuit draws a current  $I$  when a single-phase AC voltage  $V$  is applied to it. If the power factor is  $\cos \phi$ , then the dimensions of  $VI \cos \phi$  would be
- (A)  $ML^3T^{-2}$
- (B)  $ML^2T^3$
- (C)  $ML^3T^3$
- (D)  $ML^2T^{-3}$
59. A non-inductive resistor is a type of resistor that does not exhibit inductance. If  $R$ ,  $L$  and  $C$  are the parameters of a resistor, what is the condition for the resistor to be non-inductive?
- (A)  $L = CR$
- (B)  $L = CR^2$
- (C)  $C = LR^2$
- (D)  $C = R/L$
60. A current transformer has a phase error of  $3^\circ$ . The phase angle between the primary and the secondary will be
- (A)  $3^\circ$
- (B)  $177^\circ$
- (C)  $180^\circ$
- (D)  $183^\circ$

61. The power of a 3-wire balanced system was measured by a two-wattmeter method. The reading of one of the wattmeters was found to be double that of the other. What is the pf of the system?
- (A) 1.0  
(B) 0.866  
(C) 0.707  
(D) 0.5
62. In a CRO, the time-base generators supply ramp voltage to
- (A) horizontal deflecting plates  
(B) vertical deflecting plates  
(C) both horizontal and vertical deflecting plates  
(D) None of the above
63. A signal of 10 mV at 75 MHz is to be measured. Which of the following can be used?
- (A) VTVM  
(B) Cathode-ray oscilloscope  
(C) Moving-iron voltmeter  
(D) Digital multimeter
64. A meter has a full-scale deflection of  $90^\circ$  at a current of 1 A. The response of the meter is square law. Assuming spring control, the current for a deflection at  $45^\circ$  will be
- (A) 0.25 A  
(B) 0.50 A  
(C) 0.707 A  
(D) 0.67 A
65. Measurement of frequency can be done by bridge methods. Which bridge is most suitable?
- (A) Maxwell's bridge  
(B) Schering bridge  
(C) Hay's bridge  
(D) Wien's bridge
66. A resistance potentiometer is a
- (A) first-order system  
(B) second-order system  
(C) zero-order system  
(D) non-order system

67. The value of strain that results from a tensile force of 1000 N applied to a 10 m aluminium beam having a  $4 \times 10^{-4} \text{ m}^2$  cross-sectional area and modulus of elasticity  $6.89 \times 10^{10} \text{ N/m}$  will be
- (A)  $40 \mu\text{m/m}$   
 (B)  $18.15 \mu\text{m/m}$   
 (C)  $36.3 \mu\text{m/m}$   
 (D)  $72.6 \mu\text{m/m}$
68. Strain gauge, LVDT and thermocouples are examples of
- (A) active transducers  
 (B) passive transducers  
 (C) primary transducers  
 (D) analog transducers
69. In wire-wound strain gauge, the change in resistance is due to
- (A) change in diameter of the wire  
 (B) change in length of the wire  
 (C) change in both diameter and length of the wire  
 (D) change in resistivity of the material
70. Pressure transducers for measuring blood pressure are
- (A) strain gauge transducers only  
 (B) strain gauge and capacitive transducers  
 (C) resistive transducers  
 (D) fibre-optic transducers
71. In a transducer, the experimentally obtained transfer function (TF) is different from the theoretical one. The error obtained from this difference is called
- (A) zero error  
 (B) sensitivity  
 (C) non-conformity error  
 (D) dynamic error
72. A resistance potentiometer (POT) has total resistance of  $10 \text{ k}\Omega$  and is rated 4W. If the range of the POT is 0–100 mm, the sensitivity is
- (A)  $1.0 \text{ V/mm}$   
 (B)  $2.0 \text{ V/mm}$   
 (C)  $2.5 \text{ V/mm}$   
 (D)  $25 \text{ V/mm}$

- 73.** Platinum is most commonly used material for RTD because
- (A) it has a constant value resistance temperature coefficient of  $0.004/^{\circ}\text{C}$  for a temperature range of  $0-100^{\circ}\text{C}$
  - (B) its resistivity tends to increase less rapidly at higher temperatures
  - (C) it is available in pure form for commercial applications and has stability over higher ranges of temperatures
  - (D) All of the above
- 74.** A variable reluctance-type tachometer has 60 number of teeth on its rotor. The counter records 3600 counts/second. The speed in r.p.s is
- (A) 3500
  - (B) 600
  - (C) 800
  - (D) 3600
- 75.** A pressure gauge is used to measure vacuum. It indicates a gauge pressure of 5 kPa. If the atmospheric pressure is 100 kPa, the absolute pressure (in kPa) is
- (A) 105
  - (B) 0.05
  - (C) 95
  - (D) 20
- 76.** A Reynolds' number of 1000 indicates
- (A) turbulent flow
  - (B) laminar flow
  - (C) Either (A) or (B)
  - (D) flow is independent of it
- 77.** A flow meter that measures flow rates which are independent of density is
- (A) rotameter
  - (B) electromagnetic flowmeter
  - (C) venturi meter
  - (D) orifice meter
- 78.** When the reading of a pH meter changes from 5 to 7, the hydrogen ion concentration of a solution is
- (A) halved
  - (B) doubled
  - (C) increased 100 times
  - (D) decreased 100 times
- 79.** Which of the following instruments is used for humidity measurement?
- (A) Autocollimator
  - (B) Hygrometer
  - (C) Nephelometer
  - (D) Mass spectrometer

- 80.** A 50 kVA transformer has a core loss of 400 W and a full-load copper loss of 800 W. The load corresponding to the maximum efficiency is
- (A) 3.535 kVA  
 (B) 35.35 kVA  
 (C) 353.5 kVA  
 (D) 30 kVA
- 81.** A 4-pole generator with 24 conductors has a 2-layer lap winding. The pole pitch is
- (A) 24  
 (B) 12  
 (C) 6  
 (D) 4
- 82.** A DC motor connected to a 230 V supply has an armature resistance of  $0.15 \Omega$ . When the back e.m.f is 200 V, the armature current will be
- (A) 50 A  
 (B) 100 A  
 (C) 200 A  
 (D) 400 A
- 83.** A DC motor develops a torque of 120 N-m at 20 r.p.s. At 30 r.p.s, it will develop a torque of
- (A) 160 N-m  
 (B) 120 N-m  
 (C) 80 N-m  
 (D) 40 N-m
- 84.** Which reversible phenomenon in a thermocouple device exhibits the absorption and liberation of heat during flow of current through the two dissimilar copper-iron and iron-copper junctions under the application of an external electromotive force (e.m.f), these junctions to be hot and cold respectively?
- (A) Seebeck effect  
 (B) Peltier effect  
 (C) Thomson effect  
 (D) None of the above
- 85.** A thermocouple ammeter gives full-scale deflection of 10 A. When it reads one-fifth of the scale, the current will be
- (A) 2 A  
 (B) 4 A  
 (C) 4.47 A  
 (D) 5.78 A

**86.** Measurement of non-electrical quantity involves the following subsystems :

1. Amplifier block
2. Display block
3. Instrumentation block
4. Transducer block

The correct sequence of these blocks is

- (A) 4, 1, 3, 2
- (B) 1, 2, 3, 4
- (C) 4, 3, 1, 2
- (D) 1, 3, 2, 4

**87.** Selection of an instrument depends on some static and dynamic performance characteristics. The characteristic that relates to the fact as to how closely the instrument reading follows the measured variables is called

- (A) accuracy
- (B) precision
- (C) fidelity
- (D) sensitivity

**88.** A Wheatstone bridge requires a change of  $6 \Omega$  in the unknown arm of the bridge to produce a change in deflection of 3 mm of the galvanometer. The sensitivity of the instrument is

- (A) 0.5%
- (B) 2%
- (C) 0.5 mm/ $\Omega$
- (D) 2.0  $\Omega$ /mm

**89.** Which of the following are piezoelectric substances?

1. Barium titanate
2. Lead titanate
3. Lead zirconate
4. Cadmium sulphate

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



90. The voltmeter in Fig. 13 has a sensitivity of  $5000 \Omega/V$  and has a full scale of  $100 V$ . When connected as shown, it reads  $20 V$ . The resistance  $R_X$  is

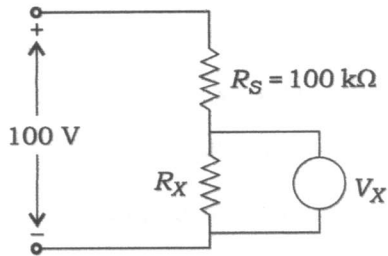


Fig. 13

- (A)  $75 \text{ k}\Omega$   
 (B)  $50 \text{ k}\Omega$   
 (C)  $25 \text{ k}\Omega$   
 (D)  $10 \text{ k}\Omega$
91. In the inferential type of flow-measuring methods, the flow rate is inferred from the characteristic effect of a related phenomenon. The inferential types of flow meters are
- (A) variable head or differential meters  
 (B) variable area meters  
 (C) turbine meters  
 (D) All of the above
92. In the inline rotating torque sensor, the strain gauges are kept on the shaft precisely at
- (A)  $90^\circ$  to the shaft axis  
 (B)  $30^\circ$  to the shaft axis  
 (C)  $60^\circ$  to the shaft axis  
 (D)  $45^\circ$  to the shaft axis
93. A message signal contains three frequencies  $5 \text{ kHz}$ ,  $10 \text{ kHz}$  and  $20 \text{ kHz}$  respectively. The bandwidth of the AM (amplitude modulated) signal is
- (A)  $40 \text{ kHz}$   
 (B)  $30 \text{ kHz}$   
 (C)  $20 \text{ kHz}$   
 (D)  $10 \text{ kHz}$
94. The saving in power of a DSB-SC system compared to AM when modulated at 80% is
- (A) nil  
 (B) 80%  
 (C) 76%  
 (D) 50%

95. In a PCM system, when the number of bits is increased from 5 to 8, the SNR increases by a factor
- (A) 4
  - (B) 16
  - (C) No change
  - (D) 64
96. An anti-aliasing filter (AAF) is a filter used before a signal sampler to restrict the bandwidth of a signal to satisfy the Nyquist-Shannon sampling theorem. Select the AAF from the given options.
- (A) High-pass filter
  - (B) Low-pass filter
  - (C) Band-pass filter
  - (D) Band-stop filter
97. Oversampling is employed for
- (A) increasing the resolution
  - (B) decreasing the resolution
  - (C) increasing the noise
  - (D) decreasing the noise
98. Photoconductive devices consist of a thin single-crystal or polycrystalline film of compound semiconductor substances. A photoconductive cell is made using which of the following materials?
- (A) Selenium
  - (B) Quartz
  - (C) Rochelle salt
  - (D) Lithium sulphate
99. An optical fibre has core refractive index (RI) = 1.5 and cladding refractive index = 1.45. If the RI of the cladding layer is 1% less than that of core, the value of numerical aperture will be
- (A) 0.2046
  - (B) 0.384
  - (C) 0.35
  - (D) 0.46
100. Optical fluid level sensors detect level of fluid easily and are safe for inflammable liquids also. They include
- (A) transmitter, detector, receiver
  - (B) LED source, optical fibre, detector, receiver
  - (C) source, fibre, optocoupler, receiver
  - (D) LASER source, dipstick, detector

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