Booklet Sl.No.: 1048

Booklet Series **D**

# 12PT-04

**TEACHERS RECRUITMENT BOARD, CHENNAI – 6**
**WRITTEN COMPETITIVE EXAMINATION FOR DIRECT RECRUITMENT OF LECTURERS IN GOVERNMENT POLYTECHNIC COLLEGES – 2012**

## ELECTRONICS AND COMMUNICATION ENGINEERING

**Time Allowed : 3 Hours ]** **[ Total Marks : 190**

**Each question carries four options namely A, B, C and D. Choose one correct option and mark in appropriate place in the OMR answer sheet.**

### SECTION – A

**( 1 mark each )**

1. The increase in signal-to-quantization noise ratio for a uniform *PCM* by an extra bit is

   A) 3 dB  B) 6 dB

   C) 8 dB  D) 12 dB.

2. In *DPCM*, the input to the quantizer is quantized by a

   A) uniform scalar quantizer

   B) non-uniform scalar quantizer

   C) uniform or non-uniform scalar quantizer

   D) none of these.

3. In delta modulation, the quantizer is a

   A) 2-bit quantizer  B) 4-bit quantizer

   C) 1-bit quantizer  D) none of these.

4. The bit rate of a digital communication system is 34 Mbps. The modulation scheme is QPSK. The baud rate of the system is

A) 68 Mbps B) 34 Mbps

C) 17 Mbps D) 8·5 Mbps.

5. Which of the following requires a synchronizing signal ?

A) *PAM* B) *PDM*

C) Single channel *PPM* D) All of these.

6. Modulation scheme used in *GSM* is

A) *DPSK* B) *QPSK*

C) *GMSK* D) *BFSK.*

7. Which technique is used for allocating capacity on a satellite channel using fixed assignment *FDM* ?

A) *AM* B) *FDMA*

C) *FM* D) *FSK.*

8. The electric field lines and equipotential lines

A) are parallel to each other

B) are one and the same

C) cut each other orthogonally

D) can be inclined to each other at any angle.

9. The value of $\oint dI$ along a circle of radius 2 unit is

A) zero B) $2\pi$

C) $4\pi$ D) $8\pi$.

D

10. Two electric dipoles aligned parallel to each other and having the same axis exert a force $F$ on each other, when at a distance $d$ apart. If the dipoles are at distance $2d$ apart, then the mutual force between them would be

A) F/2 B) F/4

C) F/8 D) F/16.

11. A system has the transfer function $\frac{(1-s)}{(1+s)}$. It is known as

A) low-pass system B) high-pass system

C) all pass system D) none of these.

12. The open loop DC gain of a unity negative feedback system with closed-loop transfer function $\frac{s+4}{s^2+7s+13}$ is

A) $\frac{4}{13}$ B) $\frac{4}{9}$

C) 4 D) 13.

13. For a feedback control system of type 2, the steady state error for a ramp input is

A) infinite B) constant

C) zero D) indeterminate.

14. For making an unstable system stable

A) gain of the system should be increased

B) gain of the system should be decreased

C) the number of zeros to the loop transfer function should be increased

D) the number of poles to the loop transfer function should be increased.

15. 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.

16. None of the poles of a linear control system lie in the right half of $S$-plane. F bounded input, the output of this system

A) is always bounded B) could be unbounded

C) always tends to zero D) none of these.

17. For a gain constant $K$, the phase-lead compensator

A) reduces the slope of the magnitude curve in the entire range of frequ domain

B) decreases the gain cross-over frequency

C) reduces the phase margin

D) reduces the resonance peak $M_p$.

18. Which of the following is an example of an open loop system ?

A) Household refrigerator

B) Respiratory system of an animal

C) Stabilization of air pressure entering into a mask

D) execution of a program by a computer.

19. The phase lead compensation is used to

A) increase the rise time and decrease the overshoot

B) decrease both rise time and overshoot

C) increase both rise time and overshoot

D) decrease rise time and increase overshoot.

20. The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{k}{s(s+1)}$$

If the gain is increased to infinity, then the damping ratio will tend to become

A) $\frac{1}{\sqrt{2}}$ B) 1

C) 0 D) $\infty$

21. The logical expression $Y = A + \overline{A}B$ is equivalent to

A) $Y = AB$ B) $Y = A\overline{B}$

C) $Y = \overline{A} + B$ D) $Y = A + B$.

22. Minterms corresponding to decimal number 15 is

A) $ABCD$ B) $\overline{A}\,\overline{B}\,\overline{C}\,\overline{D}$

C) $A + B + C + D$ D) $\overline{A} + \overline{B} + \overline{C} + \overline{D}$.

23. The maximum count for which a 6 bit binary word can represent is

A) 36 B) 64

C) 63 D) 65.

24. The hexadecimal representation of $657_8$ is

A) D 78 B) 1 AF

C) D 71 D) 32 F.

25. The output $Q_n$ of a JK flip-flop is zero. It changes to 1 when a clock pulse is applied. The input $J_n$ and $K_n$ are respectively

A) 1 and $X$ B) 0 and $X$

C) $X$ and 0 D) $X$ and 1.

26. How many flip-flops are required to build a binary counter circuit to count from 0 to 1023 ?

A) 12 B) 6

C) 10 D) 24.

27. Digital multiplexer is basically a combinational logic circuit to perform the operation

A) AND-AND B) OR-OR

C) AND-OR D) OR-AND.

28. How many 3 – to – 8 line decoders with enable output are needed to construct a 6 – to – 64 line decoder without using any other logic gates ?

A) 7 B) 8

C) 9 D) 10.

29. The number of comparators in a parallel conversion type 8-bit $A$ to $D$ converter is

A) 8 B) 16

C) 255 D) 256.

30. In standard TTL, totem pole stage refers to

A) multi-emitter input stage B) phase-splitter

C) output buffer D) open collector output stage.

31. Transient current in RLC circuit is oscillatory when

A) $R = 2\sqrt{L/C}$ B) $R = 0$

C) $R > 2\sqrt{L/C}$ D) $R < 2\sqrt{L/C}$.

32. For a two-port network, the $h$ parameters $h_{11}$ and $h_{12}$ are obtained

A) by shorting output terminals B) by opening input terminals

C) by shorting input terminals D) by opening output terminals.

33. The diffusion potential across a *p-n* junction

A) decreases with increasing doping concentration

B) increases with decreasing band gap

C) does not depend on doping concentrations

D) increases with increasing doping concentrations.

34. A Zener diode works on the principle of

A) tunnelling of charge carriers across the junction

B) thermionic emission

C) diffusion of charge carriers across the junction

D) hopping of charge carriers across the junction.

35. In a differential amplifier, CMRR can be improved by using an increased

A) emitter resistance B) collecter resistance

C) power supply voltages D) source resistance.

36. A switched mode power supply operating at 20 kHz to 100 kHz range used as the main switching element is

A) Thyristor B) MOSFET

C) Triac D) UJT.

37. In a *pnp* transistor operating in the active region, the main stream of current in the base region is

A) drift of holes B) diffusion of holes

C) drift of electrons D) diffusion of electrons.

38. Tunnel diode is a *pn* diode with

A) very high doping in *p* region

B) very high doping in *n* region

C) very high doping in both *p* and *n* regions

D) low doping in both *p* and *n* regions.

39. Avalanche breakdown results basically due to

A) impact ionization

B) strong electric field across the junction

C) emission of electrons

D) rise in temperature.

40. Which one of the following is not LED material ?

A) GaAs

B) GaP

C) SiC

D) $SiO_2$.

41. The eigenvectors of a real symmetric matrix corresponding to different eigenvalues are

A) orthogonal

B) singular

C) non-singular

D) none of these.

42. The matrix $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is

A) orthogonal matrix

B) reciprocal matrix

C) transposed matrix

D) none of these.

43. A matrix is singular if and only if it has

A) one eigenvalue

B) two eigenvalues

C) zero eigenvalue

D) none of these.

44. If $y = \log \sin x$, then $\frac{dy}{dx}$ is

A) $\frac{1}{\sin x} \cos x$

B) $\tan x$

C) $\frac{1}{\sin x}$

D) $\log \cos x$.

45. A system of equations is said to be inconsistent if

A) they have one solution

B) they have no solution

C) they have one or more solution

D) none of these.

46. The value of integral $\int_{-\pi/4}^{\pi/4} \sin^{-4} x \, dx$ is

A) $-\frac{8}{3}$ B) $\frac{8}{4}$

C) $\frac{8}{3}$ D) none of these.

47. The divergence of vector $\bar{r} = x\,\bar{i} + y\,\bar{i} + z\,\bar{i}$ is

A) $\bar{i} + \bar{j} + \bar{k}$ B) 3

C) 0 D) 1.

48. The differential equation

$$\frac{d^2y}{dx^2} + \sin x \frac{dy}{dx} + ye^x = \sinh x \text{ is}$$

A) first order and linear B) first order and non-linear

C) second order and linear D) second order and non-linear.

49. The probability that a leap year has 53 Sundays is

A) $\frac{1}{7}$ B) $\frac{2}{7}$

C) $\frac{5}{7}$ D) $\frac{6}{7}$.

50. For a symmetrical distribution the coefficient of skewness is

A) + 1 B) − 1

C) + 3 D) zero.

51. The sinusoidally time varying vector field

$\bar{F} = 2\cos(\omega t + 30°)\,\bar{a}_x + 2\cos(\omega t - 30°)\,\bar{a}_y$ is

A) elliptically polarized B) circularly polarized

C) linearly polarized D) unpolarized.

52. A solid cylindrical conductor of radius $R$ has a uniform current density $I$. The magnetic field $H$ inside the conductor at a distance $r$ from the axis of the conductor is

A) $\frac{I}{2\pi r}$ B) $\frac{I}{4\pi r}$

C) $\frac{Ir}{2\pi R^2}$ D) $\frac{Ir}{4\pi R^2}$.

53. Solutions of Laplace's equation, which are continuous through the second derivatives are called

A) Bessel functions B) odd functions

C) harmonic functions D) fundamental functions.

54. The equation of a plane wave may be written as

A) $\frac{\partial^2 E_y}{\partial t^2} = \frac{1}{\mu\varepsilon}\frac{\partial^2 E_y}{\partial x^2}$ B) $\frac{\partial^2 E_y}{\partial x^2} = \frac{1}{\mu\varepsilon}\frac{\partial^2 E}{\partial t^2}$

C) $\frac{\partial^2 E_y}{\partial t^2} = \frac{\mu}{\varepsilon}\frac{\partial^2 E}{\partial x^2}$ D) $\frac{\partial^2 E_y}{\partial t^2} = \frac{\varepsilon}{\mu}\frac{\partial^2 E}{\partial x^2}$.

55. For an elliptically polarized wave incident on the interface of a dielectric at the Brewster angle, the reflected wave will be

A) elliptically polarized B) linearly polarized

C) right circularly polarized D) left circularly polarized.

56. Consider a transmission line of characteristic impedance 50 ohm. Let it be terminated at one end by $j$ 50 ohm. The VSWR produced by it in the transmission line will be

1993

A) + 1 B) 0

C) $\infty$ D) $+j$.

57. A quarter-wave transformer matching a 75 Ω source with a 300 Ω load should have a characteristic impedance of

A) 50 Ω B) 100 Ω

C) 150 Ω D) 200Ω.

D

58. The degenerate modes in a waveguide are characterized by

A) same cut-off frequency but different field distributions

B) same cut-off frequency and same field distribution

C) different cut-off frequencies but same field distribution

D) different cut-off frequencies and different field distributions.

59. A vertical wire of 1 m length carries a current of 1 A at 10 MHz. The total radiated power is nearly

A) 0·43 W B) 0·88 W

C) 7·3 W D) 73 W.

60. Radiation resistance of a Hertzian dipole of length $dl$ is

A) $80\pi\left(\frac{dl}{\lambda}\right)^2$ ohms B) $80\pi\left(\frac{dl}{\lambda}\right)$ohms

C) $80\left(\frac{dl}{\pi}\right)$ohms D) $80\pi\left(\frac{\pi\, dl}{\lambda}\right)^2$ ohms.

61. The threshold effect in demodulators is

A) exhibited by all demodulators when the input signal to noise ratio is low

B) rapid fall on output signal to noise ratio when the input signal to noise ratio falls below a particular value

C) properly exhibited by correlation receivers

D) properly exhibited by all AM suppressed carrier coherent demodulators.

62. In a DSB-SC system with 100 % modulation, the power swing is

A) 50 % B) 66 %

C) 75 % D) 100 %.

63. In the generation of modulated signal, a varactor diode can be used for

A) FM generation only B) AM generation only

C) PM generation only D) both (B) and (C).

64. If modulation index of an AM wave is changed from 0 to 1, the transmitted

A) increases by 50 %
B) increases by 75 %
C) increases by 100 %
D) remains unaffected.

65. The envelope detector is

A) synchronous detector
B) asynchronous detector
C) product demodulator
D) coherent detector.

66. Quadrature multiplexing is

A) same as FDM
B) same as TDM
C) combination of FDM and TDM
D) scheme where same carrier frequency is used for two different signals.

67. If transmitter bandwidth is doubled in FM, then SNR is

A) also doubled
B) improved four fold
C) decreased by one fourth
D) unaffected.

68. The function of an amplitude limiter in an FM receiver is to

A) eliminate any change in amplitude of receiver FM signal
B) reduce the amplitude of the signal to suit IF amplifier
C) amplify low frequency signals
D) none of these.

69. Which of the following statements is *not* true of FM ?

A) Carrier never becomes zero
B) *J*-coefficient occasionally are negative
C) Total power remains constant with respect to modulation index
D) None of these.

D

70. In the phase shift *SSB* method to get upper side band

A) make two *L SBs* 180° out of phase

B) make two *L SBs* in phase

C) reduce the effect of noise pulses

D) limit the noise bandwidth.

71. The instruction DAA in 8085

A) converts binary to BCD

B) converts BCD to binary

C) adds contents of accumulator to accumulator

D) decrements accumulator.

72. Double integration of a unit step function would lead to

A) an impulse

B) a parabola

C) a ramp

D) a doublet.

73. Laplace transform of $\sin h\,(at)$ is

A) $\frac{a}{s^2 - a^2}$

B) $\frac{s}{s^2 - a^2}$

C) $\frac{s}{s^2 + a^2}$

D) $\frac{a}{s^2 + a^2}$.

74. Fourier series of an odd periodic function contains only

A) odd harmonics

B) even harmonics

C) cosine terms

D) sine terms.

75. A system has 3-stage cascaded amplifier, each stage having a power gain of 10 dB and noise figure of 6 dB. The overall noise figure is

A) 1·38

B) 6·8

C) 4·33

D) 10·43.

76. Fourier transform of a function $f(at)$ is given by

A) $f(at) = a\,F(\omega)$

B) $f(at) = \frac{2}{a}\,F(\omega)$

C) $f(at) = \frac{1}{a}\,F\left(\frac{\omega}{a}\right)$

D) None of these.

77. The region of convergence of the Z-transform of a unit step function is

A) $|Z| > 1$

B) $|Z| < 1$

C) | Real part of Z | > 0

D) | Real part of Z | < 0.

78. The transfer function of a system is given by $H(z) = \frac{z(3z-2)}{z^2 - z - \frac{1}{4}}$. The system is

A) causal and stable

B) causal, stable and minimum phase

C) minimum phase

D) none of these.

79. 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.

80. The discrete time system described by $y(n) = x(n^2)$ is

A) causal, linear and time varying

B) causal, non-linear and time varying

C) non-causal, linear and time-invariant

D) non-causal, non-linear and time-variant.

D

81. A junction FET can be used as a voltage variable resistor

A) at pinch-off condition
B) beyond pinch-off voltage
C) well below pinch-off condition
D) for any value of $V_{DS}$.

82. The MOSFET switch in its ON-state may be considered equivalent to

A) resistor
B) inductor
C) capacitor
D) battery.

83. Thermal runaway is not possible in FET because as the temperature increases

A) mobility decreases
B) transconductance increases
C) drain current increases
D) none of these.

84. The RMS value of a half-way rectified symmetrical square wave current of 2A is

A) $\sqrt{2}$ A
B) 1 A
C) $\frac{1}{\sqrt{2}}$ A
D) $\sqrt{3}$ A.

85. Class *AB* operation is often used in power amplifiers in order to

A) get maximum efficiency
B) remove even harmonics
C) overcome a cross-over distortion
D) reduce collector dissipation.

86. A differential amplifier is invariably used in the input stage of all OP-AMPs. This is done basically to provide OP-AMPs with a very high

A) CMRR
B) bandwidth
C) slew rate
D) open-loop gain.

87. Neutralizing capacitors are normally used in

A) Audio amplifiers
B) Video amplifiers
C) *RF* and *IF* amplifiers
D) Operational amplifiers.

88. Consider the following :

I. Oscillator
II. Emitter follower
III. Cascaded amplifier
IV. Power amplifier

Which of the following use feedback amplifiers ?

A) I and II
B) I and III
C) II and IV
D) III and IV.

89. Which one of the following circuits is used for converting a sine wave into a square wave ?

A) Astable multivibrator
B) Monostable multivibrator
C) Bistable multivibrator
D) Schmitt trigger.

90. Which one of the following oscillators is well suited for the generation of wide range audio frequency sine waves ?

A) RC phase shift oscillator
B) Wien-bridge oscillator
C) Colpitts oscillator
D) Hartley oscillator.

91. The charge when $C = 0{\cdot}001\ \mu F$ and $V = 1$ kV is

A) 0·001 C
B) 1 μC
C) 1 C
D) None of these.

92. A 330 Ω resistor is in series with the parallel combination of four 1 kΩ resistors. A 100 V source is connected to the circuit. Which resistor has the most current through it ?

A) 330 Ω resistor
B) Parallel combination of three 1 kΩ resistors
C) Parallel combination of two 1kΩ resistors
D) 1 kΩ resistor.

D

93. A network has 10 nodes and 17 branches. The number of different node pair voltages would be

A) 7
B) 9
C) 45
D) 10.

94. The cut-set schedule gives the relation between

A) branch currents and link currents
B) branch voltages and tree branch voltages
C) branch voltages and link voltages
D) branch current and tree currents.

95. A network has seven nodes and five independent loops. The number of branches in the network is

A) 13
B) 12
C) 11
D) 10.

96. Three equal resistances of 5 Ω are connected in delta. What is the resistance in one of the arms of the equivalent star circuit ?

A) 5 Ω
B) 1·33 Ω
C) 15 Ω
D) 10 Ω.

97. Superposition theorem is not valid for

A) voltage responses
B) current responses
C) power responses
D) all of these.

98. Maximum power is transferred when the load impedance is

A) equal to source resistance
B) equal to half of the source resistance
C) equal to zero
D) none of these.

99. What is the phase angle between the capacitor current and the applied voltage in a parallel RC circuit ?

A) 90° B) 0°

C) 45° D) 180°.

100. True power is defined as

A) $VI \cos \theta$ B) $VI$

C) $VI \sin \theta$ D) none of these.

101. In which district is Adichanallur which had been the habitat of human race during 1000-2000 BC located ?

A) Ariyalur B) Ramanathapuram

C) Tirunelveli D) Virudhunagar.

102. Which of the following is measured on the Richter scale ?

A) Density of liquids B) Intensity of earthquakes

C) Velocity of tornadoes D) Height of mountains.

103. Who got the Nobel Prize for Peace in the year 2011 ?

A) Thomas Sargent

B) Christopher Sims

C) Ellen Johnson Sirleaf, Leymah Gbowee and Tawakkol Karman

D) Domas Transtroma.

104. Which country won the Kabaddi World Cup, 2011 ?

A) United Kingdom B) India

C) Canada D) Germany.

105. The Raman effect is used in the study of

A) *X*-rays B) Cells

C) Chromosomes D) Molecular energy.

106. Green India Programme is the National Action plan on

A) Pollution
B) Climate change
C) Rainfall
D) Environment.

107. What is zero hour ?

A) When matters of utmost importance are raised
B) When money bill is introduced in the Lok Sabha
C) When proposals of opposition are considered
D) Interval between morning and evening sessions.

108. Which of the following is a direct tax ?

A) Excise duty
B) Sales tax
C) Income tax
D) Both (B) & (C).

109. Which work is known as an encyclopaedia of social life in the Eleventh Century ?

A) Dasakumaracharita by Dandin
B) Kathasaritsagara by Somadeva
C) Karpuramanjari by Rajasekhara
D) Rajatarangini by Kalhana.

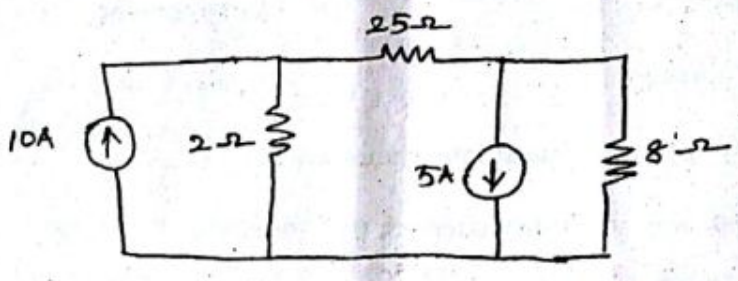
110. Who led the French forces during the battle of Waterloo ?

A) Duke of Wellington
B) Duke of Cornwall
C) Napoleon Bonaparte
D) Duke of Scotland.

## SECTION – B

**(2 marks each)**

111. In the circuit shown below, the value of $I$ is




A) 1 A B) 2 A

C) 4 A D) 8 A.

112. A water boiler of home is switched on to the a.c. mains supplying power at 230V/50Hz. The frequency of instantaneous power consumed by the boiler is

A) 0 Hz B) 50 Hz

C) 100 Hz D) 150 Hz.

113. A series RLC circuit has R = 50 Ω, L = 100μH and C = 1μF. The lower half power frequency of the circuit is

A) 30·55 kHz B) 51·92 kHz

C) 3·055 kHz D) 1·92 kHz.

114. The electron and hole concentrations in an intrinsic semiconductor are $n_i$ and $p_i$ respectively. When doped with the $p$ type material, these change to $n$ and $p$ respectively, then

A) $n + p = n_i + p_i$ B) $n + n_i = p + p_i$

C) $np_i = n_i p$ D) $np = n_i p_i$.

D

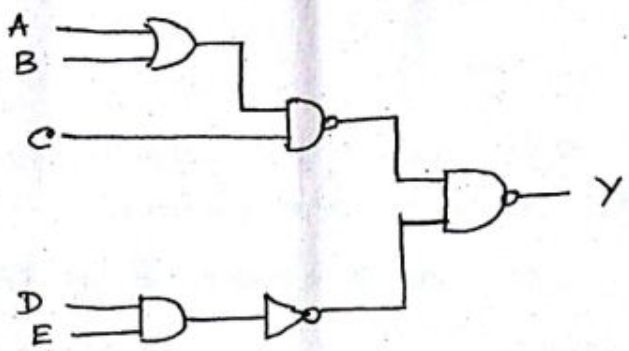
115. An $n$-channel JFET has IDSS = 1 mA and $V_p$ = – 5V. Its maximum transconductance is

A) 0·1 millimho
B) 0·4 millimho
C) 1·0 millimho
D) 4·0 millimho.

116. An op-amp having a slew rate of 62·8 V/m sec is connected in a voltage follower configuration. If the maximum amplitude of the input sinusoidal is 10V, then the minimum frequency at which the slew rate limited distortion would set in at the output is

A) 1·0 MHz
B) 6·28 MHz
C) 10·0 MHz
D) 62·8 MHz.

117. For the logic circuit shown in the figure, the output $Y$ is given by




A) $(A.B + C)\,DE$
B) $(A + B)\,C + DE$
C) $AB + C(D + E)$
D) $(A + B)\,C + D + E$.

118. The number of comparators in a parallel conversion type 8-bit A/D converter is

A) 8
B) 16
C) 255
D) 256.

119. Four memory chips of 16 × 4 size have their address buses connected together. The system will be of size

A) 64 × 64 B) 16 × 16

C) 32 × 8 D) 256 × 1.

120. The following program is written for an 8085 microprocessor to add two bytes located at memory addresses IFFE and IFFF

```
LXIH, IFFE
MOV   B, M
INR   L
MOV   A, M
ADD   B
INR   L
MOV   M, A
XOR   A
```

On completion of the execution of the program, the result of addition is found

A) in the register *A* B) at the memory address 1000

C) at the memory address IFOO D) at the memory address 2000.

121. An antenna has 40 Ω antenna resistance and 60 Ω radiation resistance. The efficiency of the antenna will be

A) 30 % B) 40 %

C) 50 % D) 60 %.

122. A transmission line having 50 Ω impedance is terminated in a load of $(40 + j\,30\ \Omega)$. The VSWR is

A) $j\,0{\cdot}033$

B) $0{\cdot}8 + j\,0{\cdot}6$

C) 1

D) 2.

123. The cut-off wavelength $\lambda_C$ for $TE_{20}$ mode for a standard rectangular waveguide is

A) $\frac{2}{a}$

B) $2a$

C) $a$

D) $2a^2$.

124. A parabolic reflector is designed to have a directivity of 30 dB at 300 MHz. If the aperture efficiency is 55 %, then the half power bandwidth is

A) 4·31°

B) 8·62°

C) 17·24°

D) none of these.

125. A 1 km long microwave link uses two antennas each having 30 dB gain. If the power transmitted by one antenna is 1 watt 3 GHz, the power received by the other antenna is approximately

1996

A) 98·6 μW

B) 76·8 μW

C) 63·4 μW

D) 55·2 μW.

126. The transfer function of a system is $\frac{10}{1+s}$. When operated as a unity feedback system, the steady state error to a unit step input will be

A) 0

B) $\frac{1}{11}$

C) 10

D) ∞.

[ Turn over

127. The maximum phase shift that can be obtained by using a lead compensator with transfer function

$G_c(s) = \frac{4(1 + 0 \cdot 15 s)}{(1 + 0 \cdot 05 s)}$ is equal to

A) 15° B) 30°

C) 45° D) 60°.

128. The transfer function $Y(s)/U(s)$ of a system described by the state equations

$\dot{x}(t) = -2x(t) + 2u(t)$ and

$\dot{y}(t) = 0{\cdot}5\, x(t)$, is

A) $\frac{0 \cdot 5}{(s-2)}$ B) $\frac{1}{(s-2)}$

C) $\frac{0 \cdot 5}{(s+2)}$ D) $\frac{1}{(s+2)}$.

129. The FM signal is being broadcast in the 88·108 MHz band having a carrier swing of 125 kHz. The modulation index is

A) 100 % B) 83 %

C) 67 % D) 50 %.

130. In a PCM system each quantization level is encoded into 8 bits. The signal to quantization noise ratio is

A) 12 dB B) 48 dB

C) 64 dB D) 256 dB.

131. An antenna has 40 Ω antenna resistance and 60 Ω radiation resistance. The efficiency of the antenna will be

A) 30 %
B) 40 %
C) 50 %
D) 60 %.

132. The channel capacity under the Gaussian noise environment for a discrete memory-less channel with a bandwidth of 4 MHz and SNR of 31 is

A) 20 Mbps
B) 4 Mbps
C) 8 kbps
D) 4 kbps.

133. A PCM system is to have a signal-to-noise ratio of 40 dB. The signals are speech and an rms-to-peak ratio of-10 dB is allowed for. The number of bits per code word is

A) 6 bits
B) 7 bits
C) 8 bits
D) 10 bits.

134. For a given data rate, the bandwidth required with $m$-ary transmission is smaller than that for binary transmission by

A) $\log_2 m$
B) $\frac{\log_2 m}{m}$
C) $\frac{2}{\log_2 m}$
D) $\frac{\log_2 m}{2}$.

135. If carrier modulated by a digital bit stream had one of the possible phases of 0, 90, 180 and 270 degrees, then the modulation is called

A) BPSK
B) QPSK
C) QAM
D) MSK.

136. The value of the determinant

$$\begin{vmatrix} 9 & 25 & 6 \\ 7 & 13 & 5 \\ 9 & 23 & 6 \end{vmatrix}$$ is

A) 6 B) 16

C) 19 D) 25.

137. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ then $(A - 2I)\ (A - 3I)$ is

A) $A$ B) $I$

C) 0 D) $5I$.

138. If $y = \tan^{-1} \dfrac{\sqrt{1 + x^2} - 1}{x}$ then

A) $y'(0) = 1$ B) $y'(0) = \dfrac{1}{2}$

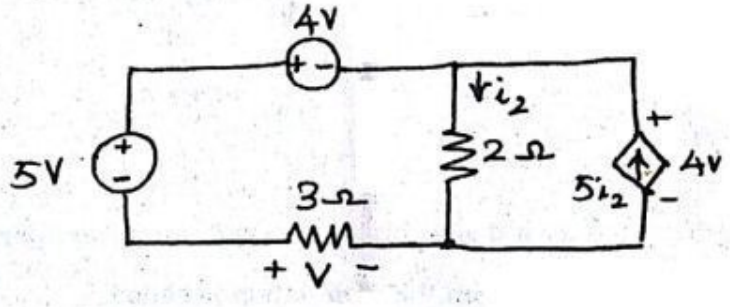
C) $y'(0) = 0$ D) $y'(0)$ does not exist.

139. If the probability of a defective bolt is 0·1, then the mean and standard deviation for the distribution of bolts in a total of 400 are

A) 30, 3 B) 40, 5

C) 30, 4 D) 40, 6.

140. The voltage $V$ in the figure shown below is equal to




A) 3 V B) − 3 V

C) 5 V D) none of these.

D

141. The output of a linear system to unit step input $u(t)$ is $t^2 e^n$. The system function $H(s)$ is

A) $\frac{2}{s^2(s+2)}$ B) $\frac{2}{(s+2)^2}$

C) $\frac{2}{(s+2)^3}$ D) $\frac{2s}{(s+2)^3}$

142. The period of the function $\cos \frac{\pi}{4}(t-1)$ is

A) $\frac{1}{8}$ s B) 8 s

C) 4 s D) $\frac{1}{4}$ s.

143. Given $f(t) = 3e^{-4t} u(t)$. Its Fourier transform $F(w)$ at $w = 4$ is

A) $\frac{1}{1+j}$ B) $\frac{\frac{3}{4}}{1+j}$

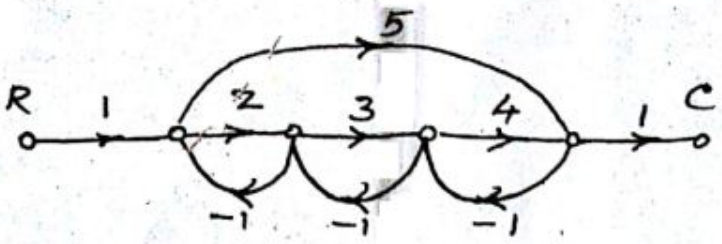
C) $\frac{1}{1+\frac{4}{3}j}$ D) $\frac{\frac{4}{3}}{1+\frac{4}{3}j}$.

144. The transfer function of a system is given by $H(s) = \frac{1}{s^2(s-2)}$. The impulse response of the system is

A) $(t^2 * e^{-2t})\, u(t)$ B) $(t * e^{2t})\, ut$

C) $(t^2 e^{-2t})\, u(t)$ D) $(t e^{2t})\, ut$.

145. In the signal flow graph of figure given below, the gain $C/R$ will be




A) $\frac{11}{9}$

B) $\frac{22}{15}$

C) $\frac{24}{23}$

D) $\frac{44}{23}$.

146. Two identical FETs each characterized by the parameters $g_m$ and $r_d$ are connected in parallel. The composite FET is then characterized by the parameters

A) $\frac{g_m}{2}$ and $2\ r_d$

B) $\frac{g_m}{2}$ and $\frac{r_d}{2}$

C) $2\ g_m$ and $\frac{r_d}{2}$

D) $2\ g_m$ and $2\ r_d$.

147. If $\alpha = 0{\cdot}995$, $I_E = 10\ mA$ and $I_{co} = 0{\cdot}5\ \mu A$ then $I_{CEO}$ will be

A) 25 μA

B) 100 μA

C) 10·1 mA

D) 10·5 mA

148. The *RMS* value of a half wave rectified symmetrical square wave current of 2A is

A) $\sqrt{2}$ A

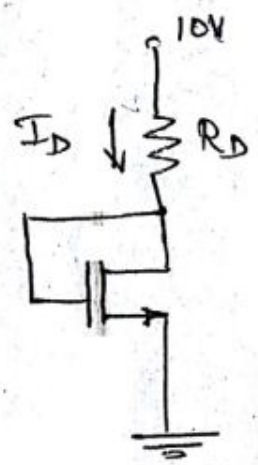
B) 1 A

C) $\frac{1}{\sqrt{2}}$ A

D) $\sqrt{3}$ A.

D

149. For the n-channel enhancement MOSFET shown in the given figure, the threshold voltage $V_{TH}$ = 2V. The drain current $I_D$ of the MOSFET is 4 mA when the drain resistance $R_D$ is 1 k Ω. If the value of $R_D$ is increased to 4 k Ω, drain current $I_D$ will become



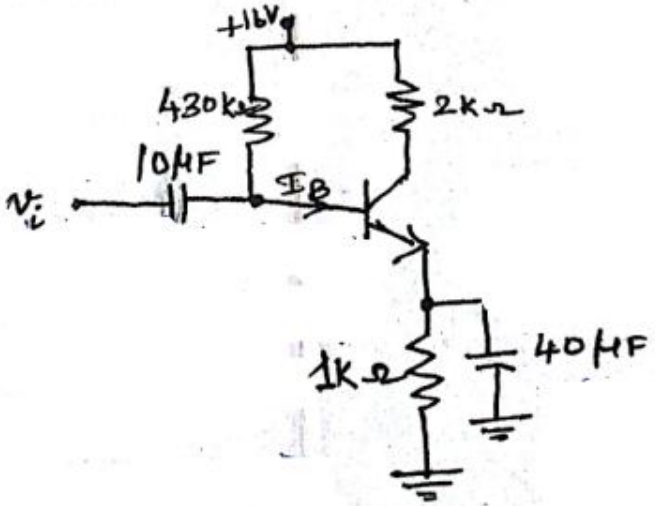

A) 2·8 mA

B) 2·0 mA

C) 1·4 mA

D) 1·0 mA.

150. For the circuit of figure shown below the value of $I_B$ is




B) 30·24 μA