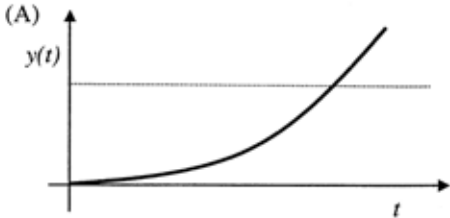
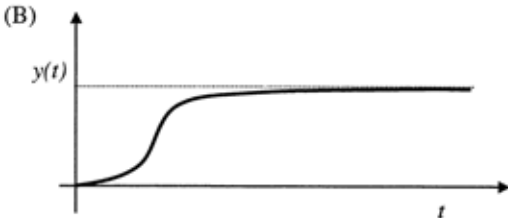
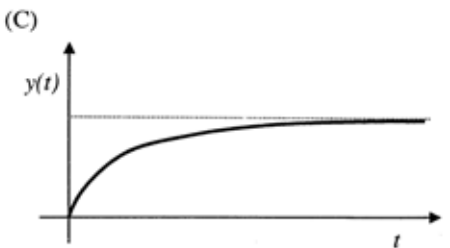
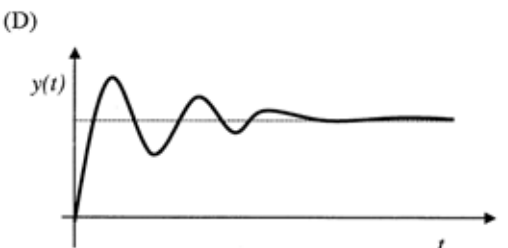
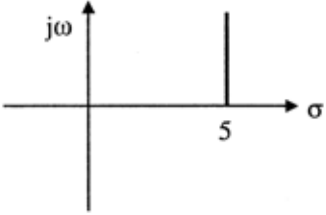
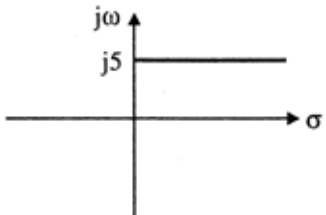
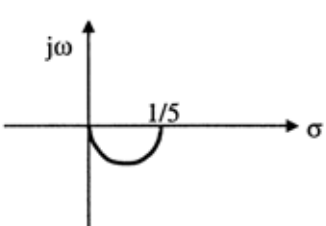
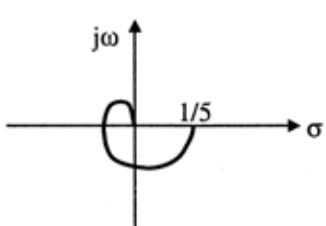
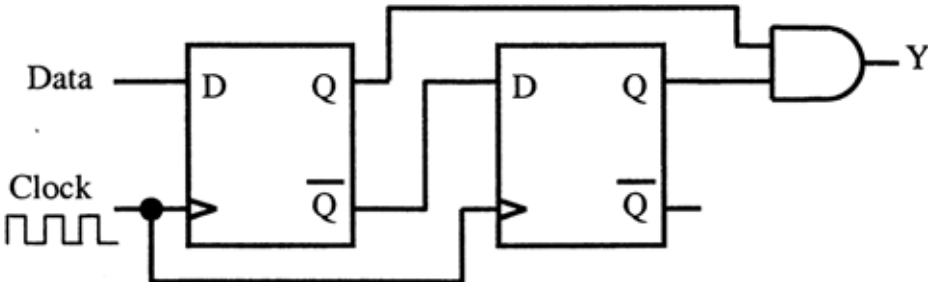
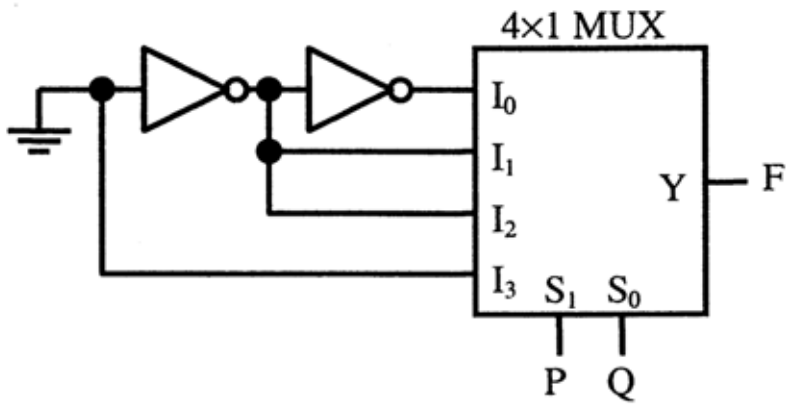
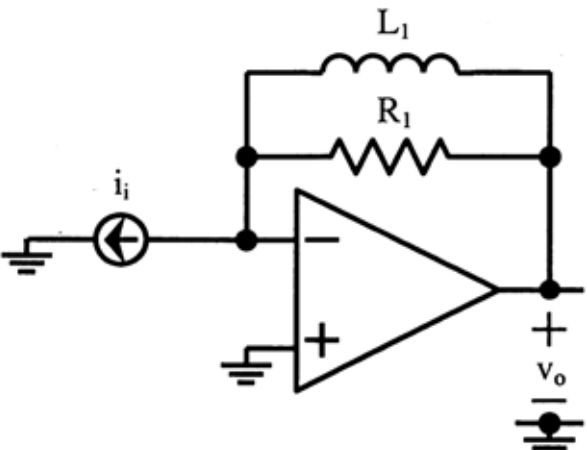
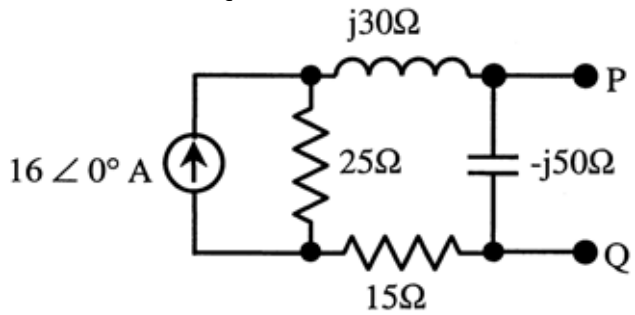
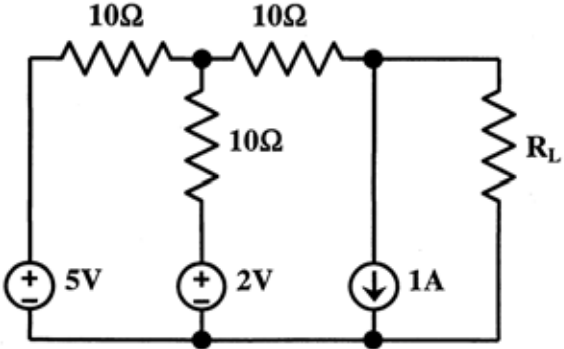
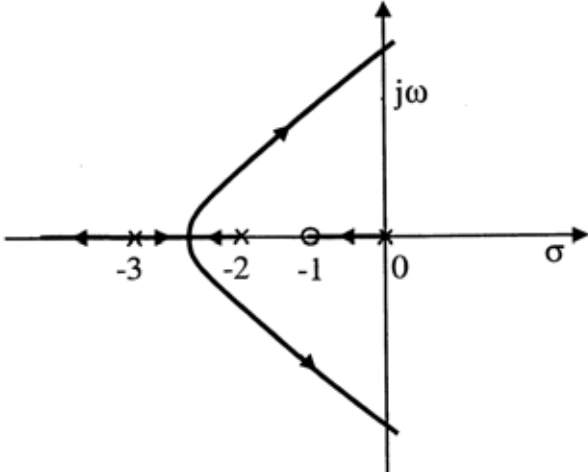


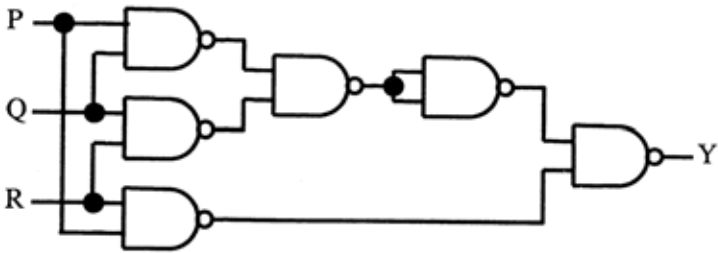
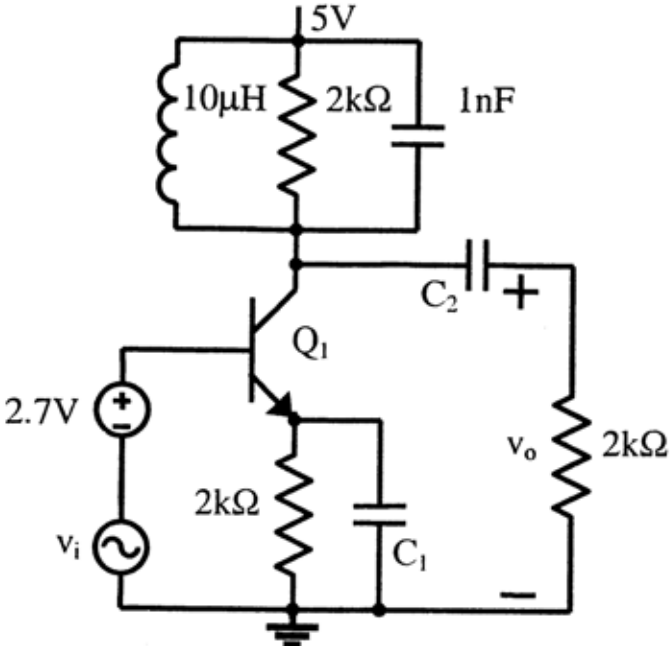
GATE question papers: Electronics and Communication Engineering 2011 (EC)

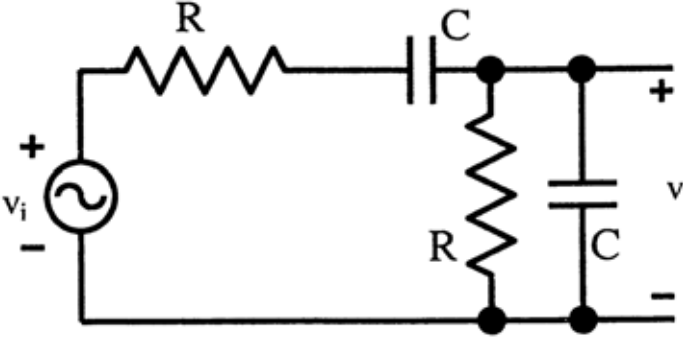
	Q. 1 - Q. 25 carry one mark each.											
1	<p>The modes in a rectangular waveguide are denoted by TE_{mn}/TM_{mn} where m and n are the eigen numbers along the larger and smaller dimensions of the waveguide respectively. Which one of the following statements is TRUE?</p> <p>(A) The TM_{10} mode of the wave does not exist (B) The TE_{10} mode of the wave does not exist (C) The TM_{10} and the TE_{10} modes both exist and have the same cut-off frequencies (D) The TM_{10} and TM_{10} modes both exist and have the same cut-off frequencies</p>	Answer: (A)										
2	<p>The Column-I lists the attributes and the Column-II lists the modulation systems. Match the attribute to the modulation system that best meets it</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: center;">Column-I</td> <td style="text-align: center;">Column-II</td> </tr> <tr> <td>P Power efficient transmission of signals</td> <td>I. Conventional AM</td> </tr> <tr> <td>Q Most bandwidth efficient transmission of voice signals</td> <td>II. FM</td> </tr> <tr> <td>R Simplest receiver structure</td> <td>III. VSB</td> </tr> <tr> <td>S Bandwidth efficient transmission of signals with Significant dc component</td> <td>IV. SSB-SC</td> </tr> </table> <p>(A) P-IV, Q-II, R-I, S-III (B) P-II, Q-IV, R-I; S-III (C) P III, Q-II, R-I; S-IV (D) P-II, Q-IV, R- III, S-I</p>	Column-I	Column-II	P Power efficient transmission of signals	I. Conventional AM	Q Most bandwidth efficient transmission of voice signals	II. FM	R Simplest receiver structure	III. VSB	S Bandwidth efficient transmission of signals with Significant dc component	IV. SSB-SC	Answer: (B)
Column-I	Column-II											
P Power efficient transmission of signals	I. Conventional AM											
Q Most bandwidth efficient transmission of voice signals	II. FM											
R Simplest receiver structure	III. VSB											
S Bandwidth efficient transmission of signals with Significant dc component	IV. SSB-SC											
3	<p>The differential equation $100 \frac{d^2y}{dt^2} - 20 \frac{dy}{dt} + y = x(t)$ describes a system with an input $x(t)$ and an output $y(t)$. The system, which is initially relaxed, is excited by a unit step input. The output $y(t)$ can be represented by the waveform</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <p>(A) </p> </div> <div style="width: 50%;"> <p>(B) </p> </div> <div style="width: 50%;"> <p>(C) </p> </div> <div style="width: 50%;"> <p>(D) </p> </div> </div>	Answer: (A)										

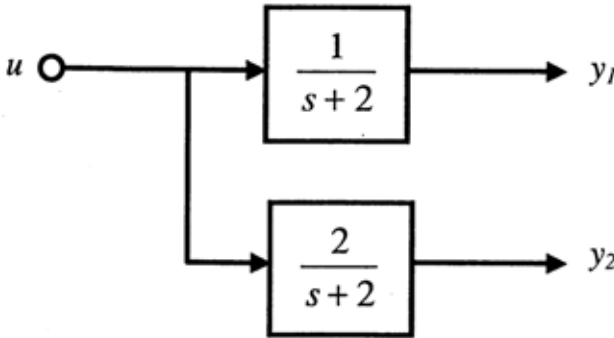
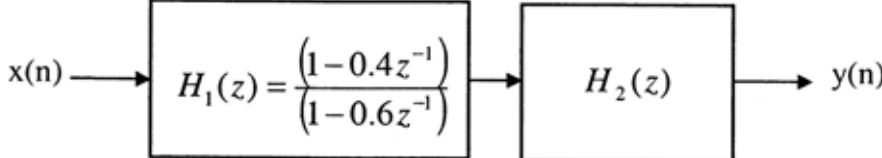
<p>4</p>	<p>For the transfer function $G(j\omega) = 5 + j\omega$, the corresponding Nyquist plot for positive frequency has the form</p> <p>(A) </p> <p>(B) </p> <p>(C) </p> <p>(D) </p>	<p>Answer: (A)</p>
<p>5</p>	<p>The trigonometric Fourier series of an even function does not have the</p> <p>(A) dc term (B) cosine terms (C) sine terms (D) odd harmonic terms</p>	<p>Answer: (C)</p>
<p>6</p>	<p>When the output Y in the circuit below is '1', it implies that data has</p>  <p>(A) changed from "0" to "1" (B) changed from "1" to "0" (C) changed in either direction (D) not changed</p>	<p>Answer: (A)</p>
<p>7</p>	<p>The logic function implemented by the circuit below is (ground implies logic "0")</p>  <p>(A) $F = \text{AND}(P,Q)$ (B) $F = \text{OR}(P,Q)$ (C) $F = \text{XNOR}(P,Q)$ (D) $F = \text{XOR}(P,Q)$</p>	<p>Answer: (D)</p>

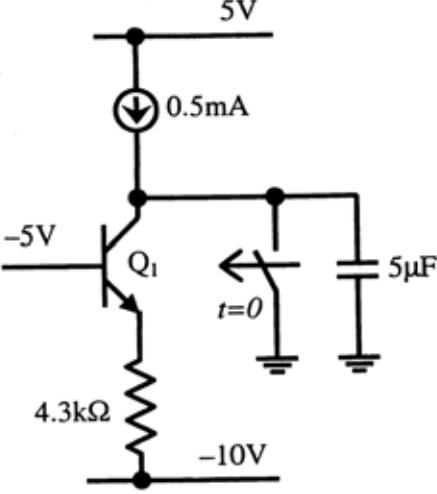
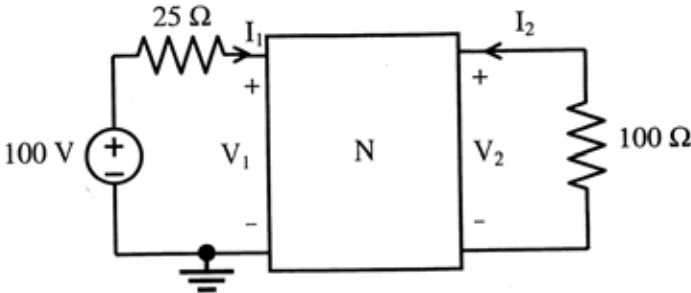
<p>8</p>	<p>The circuit below implements a filter between the input current i_i and the output voltage v_o. Assume that the opamp is ideal. The filter implemented is a</p>  <p>(A) low pass filter (B) band pass filter (C) band stop filter (D) high pass filter</p>	<p>Answer: (D)</p>
<p>9</p>	<p>A silicon PN junction is forward biased with a constant current at room temperature. When the temperature is increased by 10°C, the forward bias voltage across the PN junction</p> <p>(A) increases by 60mV (B) decreases by 60mV (C) increases by 25mV (D) decreases by 25mV</p>	<p>Answer: (D)</p>
<p>10</p>	<p>In the circuit shown below, the Norton equivalent current in amperes with respect to the terminals P and Q is</p>  <p>(A) $6.4 - j4.8$ (B) $6.56 - j7.87$ (C) $10 + j0$ (D) $16 + j0$</p>	<p>Answer: (A)</p>
<p>11</p>	<p>In the circuit shown below, the value of R_L such that the power transferred to R_L is maximum is</p>  <p>(A) 5Ω (B) 10Ω (C) 15Ω (D) 20Ω</p>	<p>Answer: (C)</p>
<p>12</p>	<p>The value of the integral $\oint_c \frac{-3z + 4}{(z^2 + 4z + 5)} dz$ where c is the circle $z = 1$ is given by</p> <p>(A) 0 (B) 1/10 (C) 4/5 (D) 1</p>	<p>Answer: (A)</p>

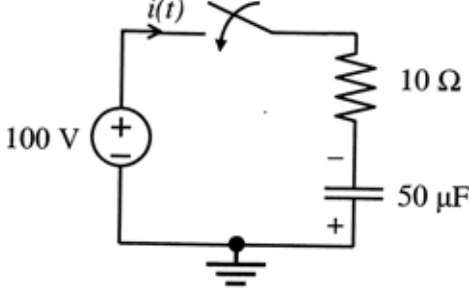
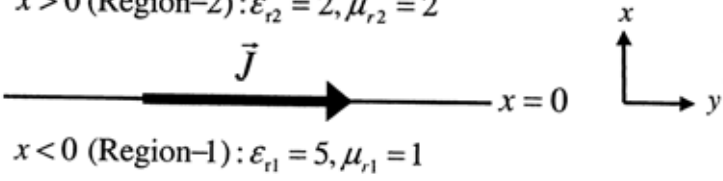
13	<p>A transmission line of characteristic impedance 50Ω is terminated by a 50Ω load. When excited by a sinusoidal voltage source at 10GHz, the phase difference between two points spaced 2mm apart on the line is found to be $\pi/4$ radians. The phase velocity of the wave along the line is</p> <p>(A) 0.8×10^8 m / s (B) 1.2×10^8 m / s (C) 1.6×10^8 m / s (D) 3×10^8 m / s</p>	Answer: (C)
14	<p>Consider the following statements regarding the complex Poynting vector \vec{P} for the power radiated by a point source in an infinite homogeneous and lossless medium. $\text{Re}(\vec{P})$ denotes the real part of \vec{P}, S denotes a spherical surface whose centre is at the point source, and \hat{n} denotes the unit surface normal on S. Which of the following statements is TRUE?</p> <p>(A) $\text{Re}(\vec{P})$ remains constant at any radial distance from the source (B) $\text{Re}(\vec{P})$ increases with increasing radial distance from the source (C) $\iint_S \text{Re}(\vec{P}) \cdot \hat{n} dS$ remains constant at any radial distance from the source (D) $\iint_S \text{Re}(\vec{P}) \cdot \hat{n} dS$ decreases with increasing radial distance from the source</p>	Answer: (D)
15	<p>An analog signal is band-limited to 4 kHz, sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantized levels are assumed to be independent and equally probable. If we transmit two quantized samples per second, the information rate is</p> <p>(A) 1 bits / second (B) 2 bits / second (C) 3 bits / second (D) 4 bits / second</p>	Answer: (D)
16	<p>The root locus plot for a system is given below. The open loop transfer function corresponding to this plot is given by</p>  <p>(A) $G(s)H(s) = k \frac{s(s+1)}{(s+2)(s+3)}$ (B) $G(s)H(s) = k \frac{(s+1)}{s(s+2)(s+3)^2}$ (C) $G(s)H(s) = k \frac{1}{s(s+1)(s+2)(s+3)}$ (D) $G(s)H(s) = k \frac{(s+1)}{s(s+2)(s+3)}$</p>	Answer: (B)
17	<p>A system is defined by its impulse response $h(n) = 2^n u(n - 2)$. The system is</p> <p>(A) stable and causal (B) causal but not stable (C) stable but not causal (D) unstable and non-causal</p>	Answer: (B)
18	<p>If the unit step response of a network is $(1 - e^{-at})$, then its unit impulse response is</p> <p>(A) ae^{-at} (B) $a^{-1} e^{-at}$ (C) $(1 - a^{-1}) e^{-at}$ (D) $(1 - a)e^{-at}$</p>	Answer: (A)

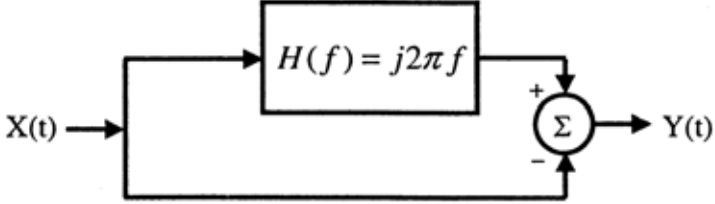
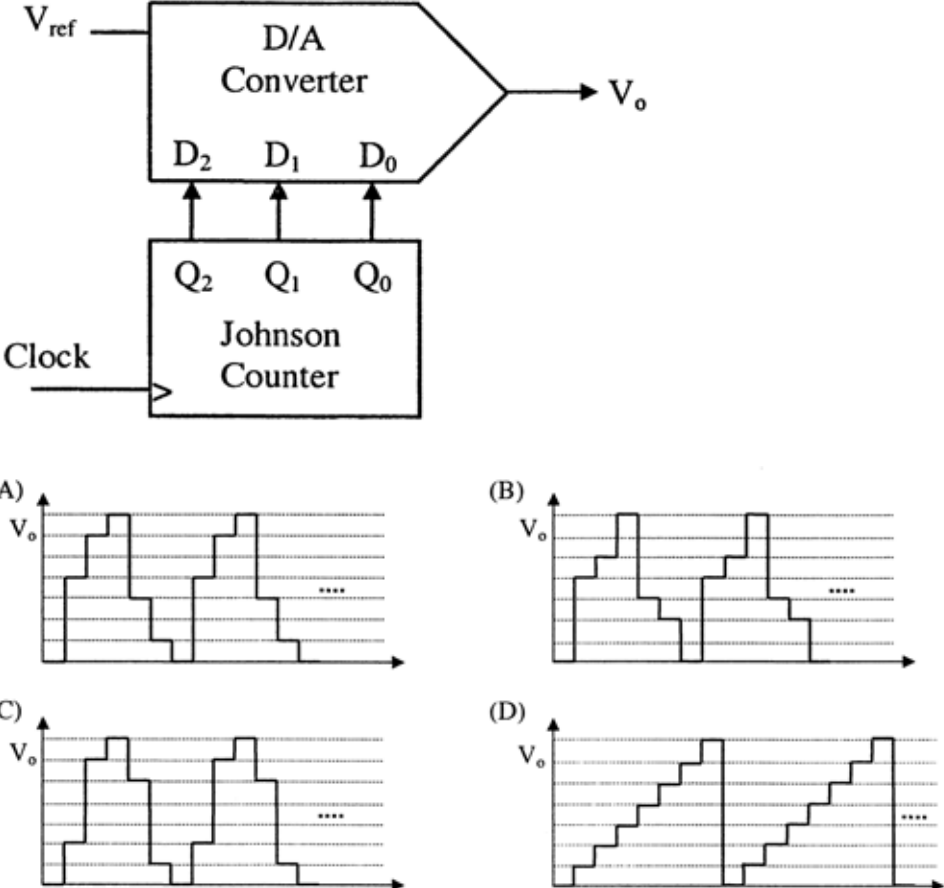
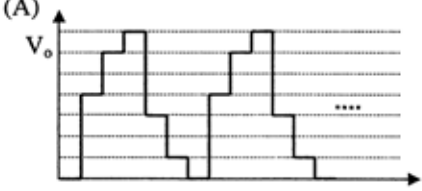
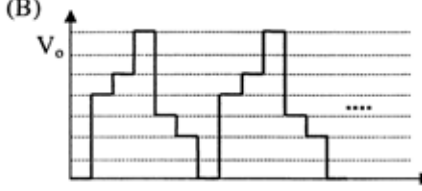
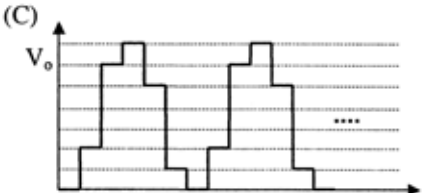
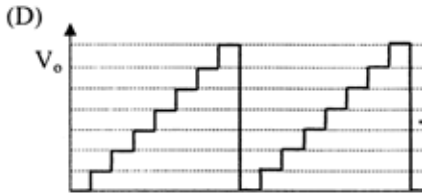
<p>19</p>	<p>The output Y in the circuit below is always "1" when</p>  <p>(A) two or more of the inputs P, Q, R are "0" (B) two or more of the inputs P, Q, R are "1" (C) any odd number of the inputs P, Q, R is "0" (D) any odd number of the inputs P, Q, R is "1"</p>	<p>Answer: (B)</p>
<p>20</p>	<p>In the circuit shown below, capacitors C_1 and C_2 are very large and are shorts at the input frequency. v_i is a small signal input. The gain magnitude v_o/v_i 10Mrad/s is</p>  <p>(A) maximum (B) minimum (C) unity (D) zero</p>	<p>Answer: (A)</p>
<p>21</p>	<p>Drift current in the semiconductors depends upon</p> <p>(A) only the electric field (B) only the carrier concentration gradient (C) both the electric field and the carrier concentration (D) both the electric field and the carrier concentration gradient</p>	<p>Answer: (C)</p>
<p>22</p>	<p>A Zener diode, when used in voltage stabilization circuits, is biased in</p> <p>(A) reverse bias region below the breakdown voltage (B) reverse breakdown region (C) forward bias region (D) forward bias constant current mode</p>	<p>Answer: (B)</p>

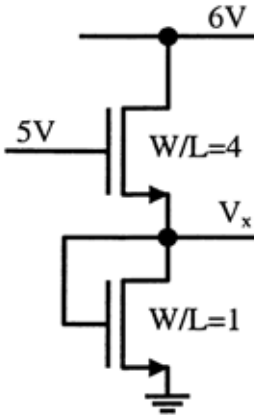
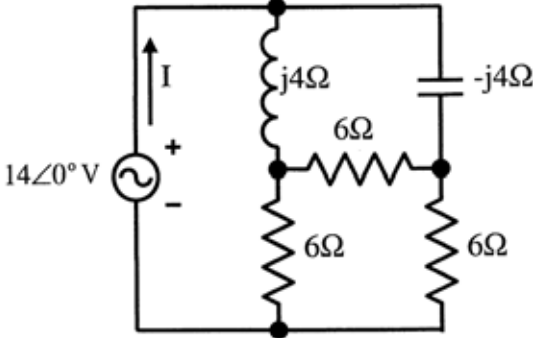
<p>23</p>	<p>The circuit shown below is driven by a sinusoidal input $v_i = V_p \cos(t/RC)$. The steady state output v_o is</p>  <p>(A) $(V_p / 3) \cos(t/RC)$ (B) $(V_p / 3) \sin(t/RC)$ (C) $(V_p / 2) \cos(t/RC)$ (D) $(V_p / 2) \sin(t/RC)$</p>	<p>Answer: (A)</p>
<p>24</p>	<p>Consider a closed surface S surrounding volume V. If \vec{r} is the position vector of a point inside S, with \hat{n} the unit normal on S, the value of the integral $\iiint_V 5\vec{r} \cdot \hat{n} \, dS$ is</p> <p>(A) 3V (B) 5V (C) 10V (D) 15V</p>	<p>Answer: (D)</p>
<p>25</p>	<p>The solution of the differential equation $\frac{dy}{dx} = ky$, $y(0) = c$ is</p> <p>(A) $x = ce^{-ky}$ (B) $x = ke^{cy}$ (C) $y = ce^{kx}$ (D) $y = ce^{-kx}$</p>	<p>Answer: (C)</p>
<p>Q.26 to Q.55 carry two marks each.</p>		
<p>26</p>	<p>The electric and magnetic fields for a TEM wave of frequency 14 GHz in a homogeneous medium of relative permittivity ϵ_r and relative permeability $\mu_r = 1$ are given by</p> $\vec{E} = E_p e^{j(\omega t - 280\pi y)} \hat{u}_z \text{ V/m}$ $\vec{H} = 3e^{j(\omega t - 280\pi y)} \hat{u}_x \text{ A/m}$ <p>Assuming the speed of light in free space to be 3×10^8 m/s, the intrinsic impedance of free space to be 120π, the relative permittivity ϵ_r of the medium and the electric field amplitude E_p are</p> <p>(A) $\epsilon_r = 3, E_p = 120\pi$ (B) $\epsilon_r = 3, E_p = 360\pi$ (C) $\epsilon_r = 9, E_p = 360\pi$ (D) $\epsilon_r = 9, E_p = 120\pi$</p>	<p>Answer: (D)</p>
<p>27</p>	<p>A message signal $m(t) = \cos 200\pi t + 4\cos \pi t$ modulates the carrier $c(t) = \cos 2\pi f_c t$ where $f_c = 1$ MHz to produce an AM signal. For demodulating the generated AM signal using an envelope detector, the time constant RC of the detector circuit should satisfy</p> <p>(A) $0.5 \text{ ms} < RC < 1 \text{ ms}$ (B) $1\mu\text{s} \ll RC < 0.5 \text{ ms}$ (C) $RC \ll \mu\text{s}$ (D) $RC \gg 0.5 \text{ ms}$</p>	<p>Answer: (B)</p>

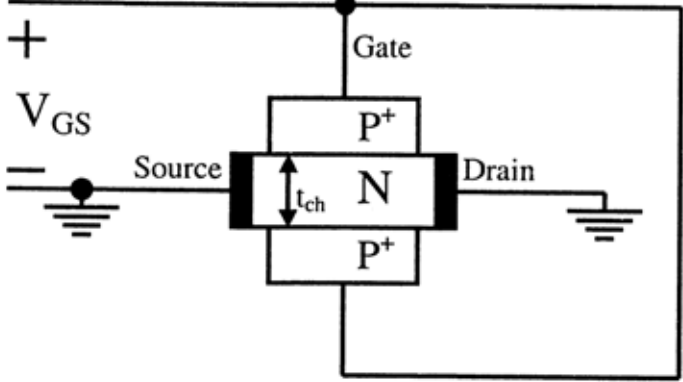
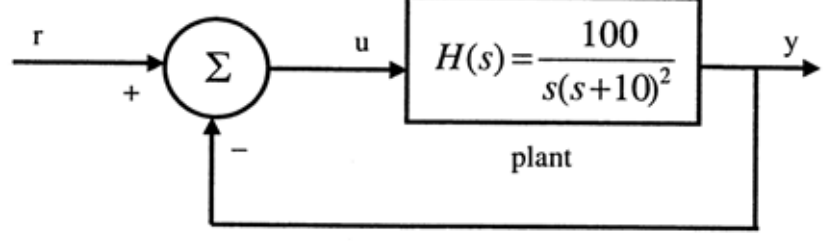
<p>28</p>	<p>The block diagram of a system with one input u and two outputs y_1 and y_2 is given below.</p>  <p>A state space model of the above system in terms of the state vector \underline{x} and the output vector $\underline{y} = [y_1 \ y_2]^T$ is</p> <p>(A) $\dot{\underline{x}} = [2]\underline{x} + [1]u;$ $\underline{y} = [1 \ 2]\underline{x}$</p> <p>(B) $\dot{\underline{x}} = [-2]\underline{x} + [1]u;$ $\underline{y} = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \underline{x}$</p> <p>(C) $\dot{\underline{x}} = \begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix} \underline{x} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u;$ $\underline{y} = [1 \ 2]\underline{x}$</p> <p>(D) $\dot{\underline{x}} = \begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix} \underline{x} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u;$ $\underline{y} = \begin{bmatrix} 1 \\ 2 \end{bmatrix} \underline{x}$</p>	<p>Answer: (B)</p>
<p>29</p>	<p>Two systems $H_1(z)$ and $H_2(z)$ are connected in cascade as shown below. The overall output $y(n)$ is the same as the input $x(n)$ with a one unit delay. The transfer function of the second system $H_2(z)$ is</p>  <p>(A) $\frac{(1 - 0.6z^{-1})}{z^{-1}(1 - 0.4z^{-1})}$ (B) $\frac{z^{-1}(1 - 0.6z^{-1})}{(1 - 0.4z^{-1})}$</p> <p>(C) $\frac{z^{-1}(1 - 0.4z^{-1})}{(1 - 0.6z^{-1})}$ (D) $\frac{(1 - 0.4z^{-1})}{z^{-1}(1 - 0.6z^{-1})}$</p>	<p>Answer: (B)</p>
<p>30</p>	<p>An 8085 assembly language program is given below. Assume that the carry flag is initially unset. The content of the accumulator after the execution of the program is</p> <pre>MVI A, 07H RLC MOV B, A RLC RLC ADD B RRC</pre> <p>(A) 8CH (B) 64H (C) 23H (D) 15H</p>	<p>Answer: (C)</p>

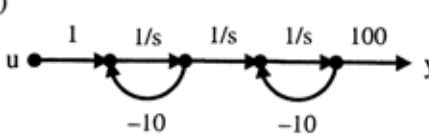
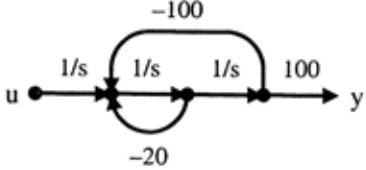
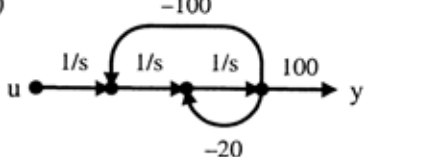
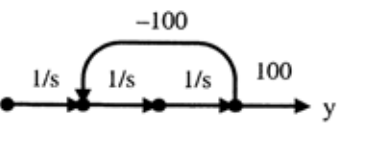
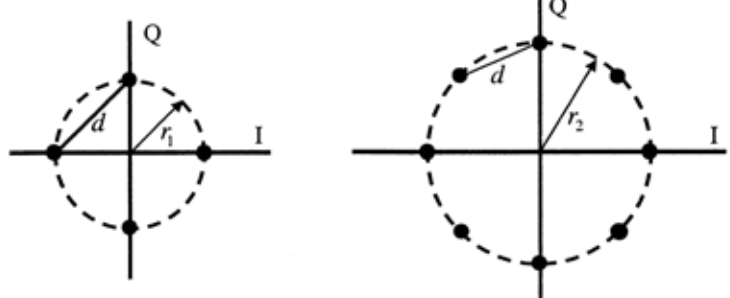
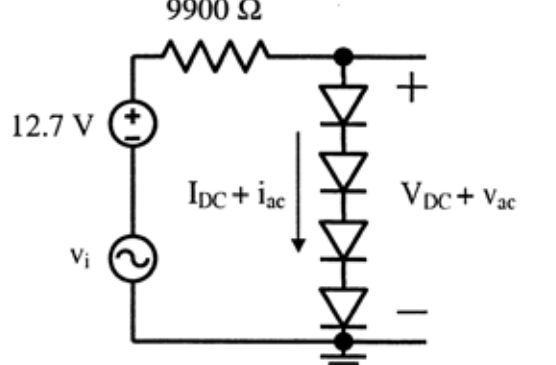
<p>31</p>	<p>The first six points of the 8-point DFT of a real valued sequence are $5, 1 - j3, 0, 3 - j4, 0$ and $3 + j4$. The last two points of the DFT are respectively</p> <p>(A) $0, 1 - j3$ (B) $0, 1 + j3$ (C) $1 + j3, 5$ (D) $1 - j3, 5$</p>	<p>Answer: (C)</p>
<p>32</p>	<p>For the BJT Q_1 in the circuit shown below, $\beta = \infty, V_{BEon} = 0.7V, V_{CEsat} = 0.7V$, The switch is initially closed. At time $t = 0$, the switch is opened. The time t at which Q_1 leaves the active region is</p>  <p>(A) 10 ms (B) 25 ms (C) 50 ms (D) 100 ms</p>	<p>Answer: (C)</p>
<p>33</p>	<p>In the circuit shown below, the network N is described by the following Y matrix:</p> $y = \begin{bmatrix} 0.1S & -0.01S \\ 0.01S & 0.1S \end{bmatrix}$ <p>The voltage gain $\frac{V_2}{V_1}$ is</p>  <p>(A) $1/90$ (B) $-1/90$ (C) $-1/99$ (D) $-1/11$</p>	<p>Answer: (D)</p>

<p>34</p>	<p>In the circuit shown below, the initial charge on the capacitor is 2.5 mC, with the voltage polarity as indicated. The switch is closed at time $t=0$. The current $i(t)$ at a time t after the switch is closed is</p>  <p>(A) $i(t) = 15\exp(-2 \times 10^3 t)$ A (B) $i(t) = 5\exp(-2 \times 10^3 t)$ A (C) $i(t) = 10\exp(-2 \times 10^3 t)$ A (D) $i(t) = -5\exp(-2 \times 10^3 t)$ A</p>	<p>Answer: (A)</p>
<p>35</p>	<p>The system of equations $x + y + z = 6$ $x + 4y + 6z = 20$ $x + 4y + \lambda z = \mu$ has NO solution for values of λ and μ given by</p> <p>(A) $\lambda = 6, \mu = 20$ (B) $\lambda = 6, \mu \neq 20$ (C) $\lambda \neq 6, \mu = 20$ (D) $\lambda \neq 6, \mu \neq 20$</p>	<p>Answer: (B)</p>
<p>36</p>	<p>A fair dice is tossed two times. The probability that the second toss results in a value that is higher than the first toss is</p> <p>(A) $2/36$ (B) $2/6$ (C) $5/12$ (D) $1/2$</p>	<p>Answer: (C)</p>
<p>37</p>	<p>A current sheet $\vec{J} = 10\hat{u}_y$ A/m lies on the dielectric interface $x = 0$ between two dielectric media with $\epsilon_{r1} = 5, \mu_{r1} = 1$ in Region-1 ($x < 0$) and $\epsilon_{r2} = 2, \mu_{r2} = 2$ in Region-2 ($x > 0$). If the magnetic field in Region-1 at $x=0^-$ is $\vec{H}_1 = 3\hat{u}_x + 30\hat{u}_y$ A/m, the magnetic field in Region-2 at $x = 0^+$ is</p>  <p>(A) $\vec{H}_2 = 1.5\hat{u}_x + 30\hat{u}_y - 10\hat{u}_z$ A/m (B) $\vec{H}_2 = 3\hat{u}_x + 30\hat{u}_y - 10\hat{u}_z$ A/m (C) $\vec{H}_2 = 1.5\hat{u}_x + 40\hat{u}_y$ A/m (D) $\vec{H}_2 = 3\hat{u}_x + 30\hat{u}_y + 10\hat{u}_z$ A/m</p>	<p>Answer: (A)</p>
<p>38</p>	<p>A transmission line of characteristic impedance 50Ω is terminated in a load impedance Z_L. The VSWR of the line is measured as 5 and the first of the voltage maxima in the line is observed at a distance of $\lambda/4$ from the load. The value of Z_L is</p> <p>(A) 10Ω (B) 250Ω (C) $(19.23 + j46.15) \Omega$ (D) $(19.23 - j46.15) \Omega$</p>	<p>Answer: (A)</p>

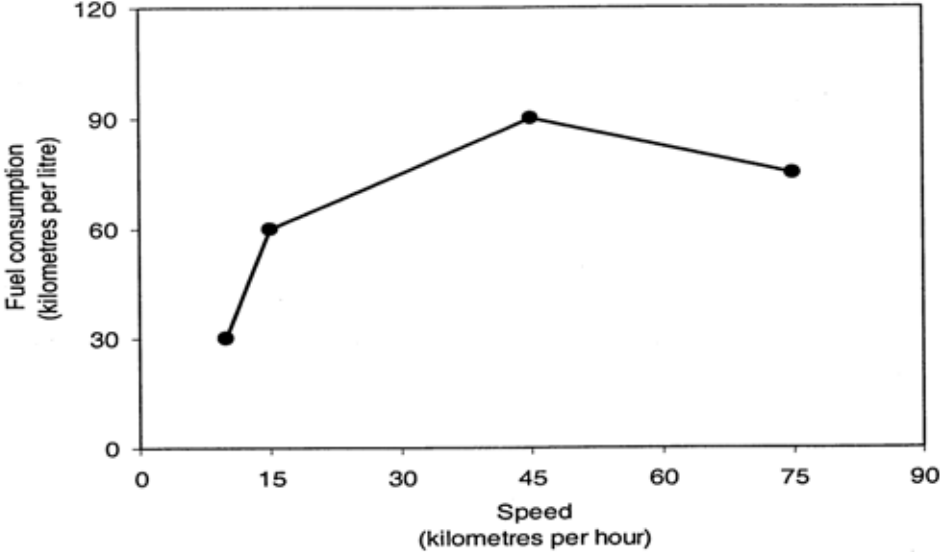
<p>39</p>	<p>$X(t)$ is a stationary random process with autocorrelation function $R_x(\tau) = \exp(-\pi\tau^2)$. This process is passed through the system shown below. The power spectral density of the output process $Y(t)$ is</p>  <p>(A) $(4\pi^2 f^2 + 1) \exp(-\pi f^2)$ (B) $(4\pi^2 f^2 - 1) \exp(-\pi f^2)$ (C) $(4\pi^2 f^2 + 1) \exp(-\pi f)$ (D) $(4\pi^2 f^2 - 1) \exp(-\pi f)$</p>	<p>Answer: (A)</p>
<p>40</p>	<p>The output of a 3-stage Johnson (twisted-ring) counter is fed to a digital-to-analog (D/A) converter as shown in the figure below. Assume all the states of the counter to be unset initially. The waveform which represents the D/A converter output V_o is</p>  <p>(A) </p> <p>(B) </p> <p>(C) </p> <p>(D) </p>	<p>Answer: (A)</p>
<p>41</p>	<p>Two D flip-flops are connected as a synchronous counter that goes through the following $Q_B Q_A$ sequence $00 \rightarrow 11 \rightarrow 01 \rightarrow 10 \rightarrow 00 \rightarrow \dots$. The combination to the inputs D_A and D_B are</p> <p>(A) $D_A = Q_B, D_B = Q_A$ (B) $D_A = \bar{Q}_A, D_B = \bar{Q}_B$ (C) $D_A = (Q_A \bar{Q}_B + \bar{Q}_A Q_B), D_B = Q_A$ (D) $D_A = (Q_A Q_B + \bar{Q}_A \bar{Q}_B), D_B = \bar{Q}_B$</p>	<p>Answer: (D)</p>

<p>42</p>	<p>In the circuit shown below, for the MOS transistors, $\mu_n C_{ox} = 100 \mu A / V^2$ and the threshold voltage $V_T = 1 V$. The voltage V_x at the source of the upper transistor is</p>  <p>(A) 1V (B) 2V (C) 3V (D) 3.67V</p>	<p>Answer: (C)</p>
<p>43</p>	<p>An input $x(t) = \exp(-2t)u(t) + \delta(t - 6)$ is applied to an LTI system with impulse response $h(t) = u(t)$. The output is</p> <p>(A) $[1 - \exp(-2t)] u(t) + u(t+6)$ (B) $[1 - \exp(-2t)] u(t) + u(t-6)$ (C) $0.5 [1 - \exp(-2t)] u(t) + u(t+6)$ (D) $0.5 [1 - \exp(-2t)] u(t) + u(t-6)$</p>	<p>Answer: (D)</p>
<p>44</p>	<p>For a BJT the common base current gain $\alpha = 0.98$ and the collector base junction reverse bias saturation current $I_{CO} = 0.6 \mu A$. This BJT is connected in the common emitter mode and operated in the active region with a base drive current $I_B = 20 \mu A$. The collector current I_C for this mode of operation is</p> <p>(A) 0.98mA (B) 0.99mA (C) 1.0mA (D) 1.01mA</p>	<p>Answer: (D)</p>
<p>45</p>	<p>If $F(s) = \mathcal{L}[f(t)] = \frac{2(s+1)}{s^2 + 4s + 7}$ then the initial and final values of $f(t)$ are respectively</p> <p>(A) 0,2 (B) 2,0 (C) 0,2/7 (D) 2/7,0</p>	<p>Answer: (B)</p>
<p>46</p>	<p>In the circuit shown below, the current I is equal to</p>  <p>(A) $1.4 \angle 0^\circ A$ (B) $2.0 \angle 0^\circ A$ (C) $2.8 \angle 0^\circ A$ (D) $3.2 \angle 0^\circ A$</p>	<p>Answer: (B)</p>

<p>47</p>	<p>A numerical solution of the equation $f(x) = x + \sqrt{3} - 3 = 0$ can be obtained using Newton- Raphson method. If the starting value is $x = 2$ for the iteration, the value of x that is to be used in the next step is (A) 0.306 (B) 0.739 (C) 1.694 (D) 2.306</p>	<p>Answer: (C)</p>
<p>Common Data Questions</p>		
<p>Common Data Questions: 48 & 49</p>		
<p>The channel resistance of an N-channel JFET shown in the figure below is 600 Ω when the full channel thickness (t_{ch}) of $10\mu\text{m}$ is available for conduction. The built-in voltage of the gate $P^+ N$ junction (V_{bi}) is -1 V. When the gate to source voltage (V_{GS}) is 0 V, the channel is depleted by $1\mu\text{m}$ on each side due to the built-in voltage and hence the thickness available for conduction is only $8\mu\text{m}$</p>		
		
<p>48</p>	<p>The channel resistance when $V_{GS} = 0\text{ V}$ is (A) $480\ \Omega$ (B) $600\ \Omega$ (C) $750\ \Omega$ (D) $1000\ \Omega$</p>	<p>Answer: (C)</p>
<p>49</p>	<p>The channel resistance when $V_{GS} = -3\text{ V}$ is (A) $360\ \Omega$ (B) $917\ \Omega$ (C) $1000\ \Omega$ (D) $3000\ \Omega$</p>	<p>Answer: (C)</p>
<p>Common Data Questions: 50 & 51</p>		
<p>The input-output transfer function of a plant $H(s) = \frac{100}{s(s+1)^2}$. The plant is placed in a unity negative feedback configuration as shown in the figure below.</p>		
		

<p>50</p>	<p>The signal flow graph that DOES NOT model the plant transfer function $H(s)$ is</p> <p>(A) </p> <p>(B) </p> <p>(C) </p> <p>(D) </p>	<p>Answer: (D)</p>
<p>51</p>	<p>The gain margin of the system under closed loop unity negative feedback is</p> <p>(A) 0 dB (B) 2 0dB (C) 26 dB (D) 46 dB</p>	<p>Answer: (C)</p>
<p>Linked Answer Questions</p>		
<p>Statement for Linked Answer Questions: 52 & 53</p>		
<p>A four-phase and an eight-phase signal constellation are shown in the figure below.</p>		
		
<p>52</p>	<p>For the constraint that the minimum distance between pairs of signal points be d for both constellations, the radii r_1, and r_2 of the circles are</p> <p>(A) $r_1 = 0.707d, r_2 = 2.782d$ (B) $r_1 = 0.707d, r_2 = 1.932d$ (C) $r_1 = 0.707d, r_2 = 1.545d$ (D) $r_1 = 0.707d, r_2 = 1.307d$</p>	<p>Answer: (D)</p>
<p>53</p>	<p>Assuming high SNR and that all signals are equally probable, the additional average transmitted signal energy required by the 8-PSK signal to achieve the same error probability as the 4-PSK signal is</p> <p>(A) 11.90 dB (B) 8.73 dB (C) 6.79 dB (D) 5.33 dB</p>	<p>Answer: (D)</p>
<p>Statement for Linked Answer Questions: 54 & 55</p>		
<p>In the circuit shown below, assume that the voltage drop across a forward biased diode is 0.7 V. The thermal voltage $V_t = kT/q = 25mV$. The small signal input $v_i = V_p \cos(\omega t)$ where $V_p = 100mV$.</p>		
		

54	The bias current I_{DC} through the diodes is (A) 1 mA (B) 1.28 mA (C) 1.5 mA (D) 2 mA	Answer: (A)
55	The ac output voltage v_{ac} is (A) $0.25\cos(\omega t)$ mV (B) $1\cos(\omega t)$ mV (C) $2\cos(\omega t)$ mV (D) $22\cos(\omega t)$ mV	Answer: (C)
General Aptitude (GA) Questions:		
56	Q. 56 to Q. 60 carry one marks each The question below consists of a pair of related words followed by four pairs of words. Select the pair that best expresses the relation in the original pair: Gladiator : Arena (A) dancer : stage (B) commuter: train (C) teacher : classroom (D) lawyer : courtroom	Answer: (D)
57	There are two candidates P and Q in an election. During the campaign, 40% of the voters promised to vote for P, and rest for Q. However, on the day of election 15% of the voters went back on their promise to vote for P and instead voted for Q. 25% of the voters went back on their promise to vote for Q and instead voted for P. Suppose, P lost by 2 votes, then what was the total number of voters? (A) 100 (B) 110 (C) 90 (D) 95	Answer: (A)
58	Choose the most appropriate word from the options given below to complete the following sentence: It was her view that the country's problems had been_____ by foreign technocrats, so that to invite them to come back would be counter-productive. (A) Identified (B) ascertained (C) exacerbated (D) Analysed	Answer: (C)
59	Choose the word from the options given below that is most nearly opposite in meaning to the given word: Frequency (A) periodicity (B) rarity (C) gradualness (D) persistency	Answer: (B)
60	Choose the most appropriate word from the options given below to complete the following sentence: Under ethical guidelines recently adopted by the Indian Medical Association, human genes are to be manipulated only to correct diseases for which_____ treatments are unsatisfactory. (A) Similar (B) Most (C) Uncommon (D) Available	Answer: (D)

Q. 61 to Q. 65 carry two marks each.																	
61	<p>The horse has played a little known but very important role in the field of medicine. Horses were injected with toxins of diseases until their blood built up immunities. Then a serum was made from their blood. Serums to fight with diphtheria and tetanus were developed this way.</p> <p>It can be inferred from the passage that horses were</p> <p>(A) given immunity to diseases (B) generally quite immune to diseases (C) given medicines to fight toxins (D) given diphtheria and tetanus serums</p>	Answer: (B)															
62	<p>The fuel consumed by a motorcycle during a journey while traveling at various speeds is indicated in the graph below.</p>  <p>The distances covered during four laps of the journey are listed in the table below</p> <table border="1" data-bbox="252 1176 1197 1377"> <thead> <tr> <th>Lap</th> <th>Distance (kilometers)</th> <th>Average speed (kilometers per hour)</th> </tr> </thead> <tbody> <tr> <td>P</td> <td>15</td> <td>15</td> </tr> <tr> <td>Q</td> <td>75</td> <td>45</td> </tr> <tr> <td>R</td> <td>40</td> <td>75</td> </tr> <tr> <td>S</td> <td>10</td> <td>10</td> </tr> </tbody> </table> <p>From the given data, we can conclude that the fuel consumed per kilometre was least during the lap</p> <p>(A) P (B) Q (C) R (D) S</p>	Lap	Distance (kilometers)	Average speed (kilometers per hour)	P	15	15	Q	75	45	R	40	75	S	10	10	Answer: (A)
Lap	Distance (kilometers)	Average speed (kilometers per hour)															
P	15	15															
Q	75	45															
R	40	75															
S	10	10															
63	<p>Three friends, R, S and T shared toffee from a bowl. R took $\frac{1}{3}$rd of the toffees, but returned four to the bowl. S took $\frac{1}{4}$th of what was left but returned three toffees to the bowl. T took half of the remainder but returned two back into the bowl. If the bowl had 17 toffees left, how many toffees-were originally there in the bowl?</p> <p>(A) 38 (B) 31 (C) 48 (D) 41</p>	Answer: (C)															
64	<p>Given that $f(y) = y / y$, and q is any non-zero real number, the value of $f(q) - f(-q)$ is</p> <p>(A) 0 (B) -1 (C) 1 (D) 2</p>	Answer: (D)															
65	<p>The sum of n terms of the series $4+44+444+\dots$ is</p> <p>(A) $(4/81) [10^{n+1} - 9n - 1]$ (B) $(4/81) [10^{n-1} - 9n - 1]$ (C) $(4/81) [10^{n+1} - 9n - 10]$ (D) $(4/81) [10^n - 9n - 10]$</p>	Answer: (C)															

End of Question Papers