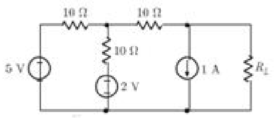
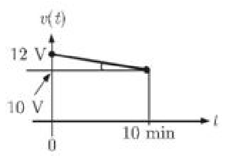
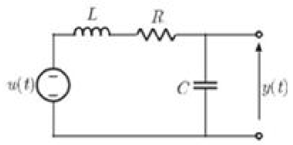
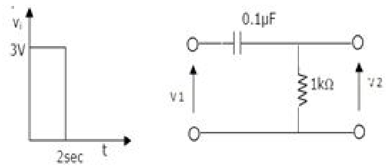
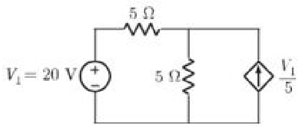
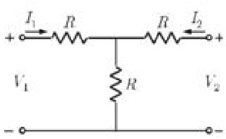
Subject Code : 606 Section Code : -Select- Difficulty: 1

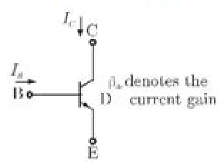
Subject Code	Q Id	Questions	Answer Key
606	301	A source $V_s(t)$ = V cos 100πt has an internal impedance of (4 + j3)Ω. If a purely resistive load connected to this source has to extract the maximum power out of the source, its value in Ω should be (A) 3 (B) 4 (C) 5 (D) 7	(C)
606	302	In the circuit shown below, the value of R_L such that the power transferred to R_L is maximum is  (A) 5Ω (B) 10Ω (C) 15Ω (D) 20Ω	(C)
606	303	For parallel *RLC* circuit, which one of the following statements is NOT correct? (A) ������������������������ The bandwidth of the circuit decreases if *R* is increased (B) The bandwidth of the circuit remains same if *L* is increased (C) At resonance, input impedance is a real quantity (D) At resonance, the magnitude of input impedance attains its minimum value.	(D)
606	304	In a simple DC circuit with a constant voltage, where the resistance increases current will (A) Decrease (B) Stop (C) Increase (D) Remain constant	(A)
606	305	A fully charged mobile phone with a 12 V battery is good for a 10 minute talk-time. Assume that, during the talk-time the battery delivers a constant current of 2 A and its voltage drops linearly from 12 V to 10 V as shown in the figure. How much energy does the battery deliver during this talk-time? 	(C)

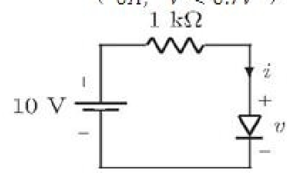
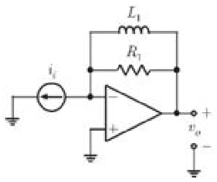
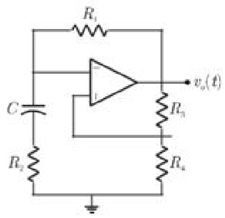
		(A) 220 J (B) 12 kJ (C) 13.2 kJ (D) 14.4 J	
606	306	An independent voltage source in series with an impedance $Z_s=R_s+jX_s$ delivers a maximum average power to a load impedance Z_L when (A) Z_L = Rs + jXs (B) Z_L= Rs (C) $Z_L=jX_s$ (D) $Z_L=R_s-jX_s$	(D)
606	307	The condition on R, L and C such that the step response $y(t)$ in the figure has no oscillations, is  (A) R $\geq \frac{1}{2}\sqrt{L/C}$ (B) R $\geq \sqrt{L/C}$ (C) R$\geq$ 2 $\sqrt{L/C}$ (D) R = $1/\sqrt{L/C}$	(C)
606	308	Voltage follower can be used as a (A) Peak detector (B) Summer (C) Impedance matcher (D) Integrator	(C)
606	309		(B)

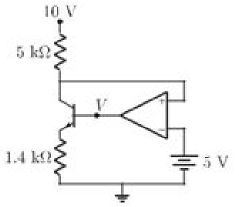
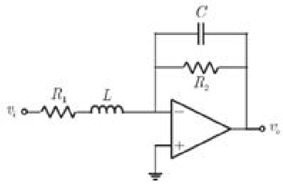
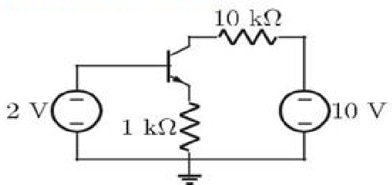
		A square pulse of 3 volts amplitude is applied to C – R circuit shown in the figure. The capacitor is initially uncharged. The output voltage V2 at time t = 2 sec is  (A) 3 V (B) –3 V (C) 4 V (D) –4 V	
606	310	Twelve 1 Ω resistance are used as edges to form a cube. The resistance between two diagonally opposite corners of the cube is (A) $\frac{5}{6}\Omega$ (B) 1 Ω (C) $\frac{6}{5}\Omega$ (D) $\frac{3}{2}\Omega$	(A)
606	311	The dependent current source shown in the figure  (A) delivers 80 W (B) absorbs 80 W (C) delivers 40 W (D) absorbs 40 W	(A)
606	312	A 2-port network is shown in the given figure. The parameter h_{21} for this network can be given by  (A) –1/2	(A)

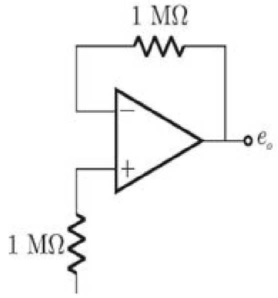
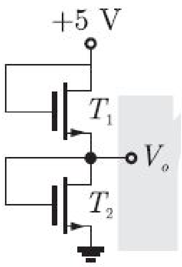
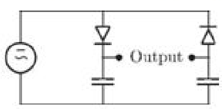
		(B) =1/2 (C) –3/2 (D) +3/2	
606	313	Superposition theorem is NOT applicable to networks containing (A) nonlinear elements (B) dependent voltage sources (C) dependent current sources (D) transformers	(A)
606	314	A high-Q quartz crystal exhibits series resonance at the frequency w_s and parallel resonance at the frequency w_p. Then (A) w_s is very close to, but less than w_p (B) $w_s << w_p$ (C) w_s is very close to, but greater than w_p (D) $w_s >> w_p$	(A)
606	315	The number of independent loops for a network with *n* nodes and *b* branches is (A) $n - 1$ (B) $b - n$ (C) $b - n + 1$ (D) independent of the number of nodes	(C)
606	316	In a forward biased pn junction diode, the sequence of events that best describes the mechanism of current flow is (A) injection, and subsequent diffusion and recombination of minority carriers (B) injection, and subsequent drift and generation of minority carriers (C) extraction, and subsequent diffusion and generation of minority carriers (D) extraction, and subsequent drift and recombination of minority carriers	(A)
606	317	In a MOSFET operating in the saturation region, the channel length modulation effect causes (A) an increase in the gate-source capacitance (B) a decrease in the transconductance (C) a decrease in the unity-gain cutoff frequency (D) a decrease in the output resistance	(D)
606	318	Thin gate oxide in a CMOS process is preferably grown using (A) wet oxidation (B) dry oxidation (C) epitaxial oxidation (D) ion implantation	(B)
606	319	The DC current gain (β) of a BJT is 50. Assuming that the emitter injection efficiency is 0.995, the base transport factor is (A) 0.98 (B) 0.985	(B)

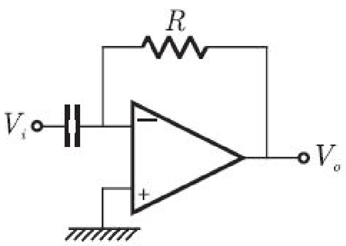
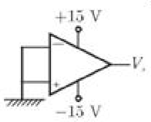
		(C) 0.99 (D) 0.995	
606	320	The phenomenon known as “Early Effect” in a bipolar transistor refers to a reduction of the effective base-width caused by (A) Electron - hole recombination at the base (B) The reverse biasing of the base - collector junction (C) The forward biasing of emitter-base junction (D) The early removal of stored base charge during saturation-to-cut off switching	(B)
606	321	A MOS capacitor made using ‘p’ type substrate is in the accumulation mode. The dominan charge in the channel is due to the presence of (A) holes (B) electrons (C) positively charged icons (D) negatively charged ions	(B)
606	322	An n -type silicon bar 0.1 cm long and 100 μm^2 cross-sectional area has a majority carrier concentration of $5 \times 10^{20} / m^2$ and the carrier mobility is 0.13 m^2/V-s at 300 K. If the charge of an electron is 1.5×10^{-19} coulomb, then the resistance of the bar is (A) 106 Ohm (B) 104 Ohm (C) 10–1 Ohm (D) 10–4 Ohm	(A)
606	323	A particular green LED emits light of wavelength 5490 A° The energy band gap of the semiconductor material used there is (Plank's constant = 6.626×10^{-34} J – s) (A) 2.26 eV (B) 1.98 eV (C) 1.17 Ev (D) 0.74 eV	(A)
606	324	The static characteristic of an adequately forward biased *p*- *n* junction is a straight line, if the plot is of (A) log *I* vs log *V* (B) log *I* vs *V* (C) *I* vs log *V* (D) *I* vs *V*	(B)
606	325	In a bipolar transistor at room temperature, if the emitter current is doubled the voltage across its base-emitter junction (A) doubles (B) halves (C) increases by about 20 mV (D) decreases by about 20 mV	(C)

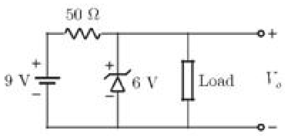
606	326	The common-emitter short-circuit current gain b of a transistor (A) is a monotonically increasing function of the collector current I_C (B) is a monotonically decreasing function of I_C (C) ������������������������ increase with I_C, for low I_C, reaches a maximum and then decreases with further increase in I_C (D) is not a function of I_C	(C)
606	327	For a MOS capacitor fabricated on a *p*-type semiconductor, strong inversion occurs when (A) surface potential is equal to Fermi potential (B) surface potential is zero (C) ������������������������ surface potential is negative and equal to Fermi potential in magnitude (D) surface potential is positive and equal to twice the Fermi potential	(D)
606	328	An n-channel JEFT has $I_{DSS} = 2$ mA and Vp = −4 V. Its transconductance g_m (in milliohm) for an applied gate-to-source voltage VGS of −2 V is (A) 0.25 (B) 0.5 (C) 0.75 (D) 1.0	(B)
606	329	If the transistor in the figure is in saturation, then  (A) I_C is always equal to β_{dc} I_B (B) I_C is always equal to - β_{dc} I_B (C) I_C is greater than or equal to β_{dc} I_B (D) IC is less than or equal to β_{dc} I□	(D)
606	330	Choose proper substitutes for X and Y to make the following statement correct Tunnel diode and Avalanche photo diode are operated in X bias ad Y bias respectively. (A) X: reverse, Y: reverse (B) X: reverse, Y: forward (C) X: forward, Y: reverse (D) X: forward, Y: forward	(C)
606	331		(D)

		The *i*-*v* characteristics of the diode in the circuit given below are $\begin{pmatrix} \frac{v-0.7}{500} A & V \geq 07V \\ 0A, & V < 0.7V \end{pmatrix}$  The current in the circuit is (A) 10 mA (B) 9.3 mA (C) 6.67 mA (D) 6.2 mA	
606	332	The circuit below implements a filter between the input current i_i and the output voltage v_o. Assume that the op-amp is ideal. The filter implemented is a  (A) low pass filter (B) band pass filter (C) band stop filter (D) high pass filter	(D)
606	333	In the following a stable multivibrator circuit, which properties of $v_0(t)$depend on R2?  (A) Only the frequency (B) Only the amplitude (C) Both the amplitude and the frequency (D) Neither the amplitude nor the frequency	(A)
606	334		(D)

		In the circuit shown below, the op-amp is ideal, the transistor has V_{BE} = 0.6 V and β = 150. Decide whether the feedback in the circuit is positive or negative and determine the voltage V at the output of the op-amp.  (A) Positive feedback, V = 10 V (B) Positive feedback, V = 0 V (C) Negative feedback, V = 5 V (D) Negative feedback, V = 2 V	
606	335	The OPAMP circuit shown above represents a  (A) high pass filter (B) low pass filter (C) band pass filter (D) band reject filter	(B)
606	336	In a transconductance amplifier, it is desirable to have (A) a large input resistance and a large output resistance (B) a large input resistance and a small output resistance (C) aa small input resistance and a large output resistance (D) a small input resistance and a small output resistance	(A)
606	337	For the BJT circuit shown, assume that the β of the transistor is very large and V_{BE} = 0.7 V. The mode of operation of the BJT is  (A) cut-off (B) saturation (C) normal active (D) reverse active	(B)
606	338		(C)

		The voltage e0 is indicated in the figure has been measured by an ideal voltmeter. Which of the following can be calculated?  (A) Bias current of the inverting input only (B) Bias current of inverting and non-inverting input only (C) Input offset current only (D) Both the bias currents and input offset current	
606	339	Both transistors T1 and T2 show in the figure, have a $\beta = 100$, threshold voltage of 1 Volts. The device parameters K_1 and K_2 of T_1 and T_2 are, respectively, 36 $\mu A/V^2$ and 9 $\mu A/V^2$. The output voltage Vo i s  (A) 1 V (B) 2 V (C) 3 V (D) 4 V	(D)
606	340	Voltage series feedback (also called series-shunt feedback) results in (A) increase in both input and output impedances (B) decrease in both input and output impedances (C) increase in input impedance and decrease in output impedance (D) decrease in input impedance and increase in output impedance	(C)
606	341	The circuit shown in the figure is best described as a  (A) bridge rectifier (B) ring modulator (C) frequency discriminator (D) voltage doubler	(D)
606	342	If the differential voltage gain and the common mode voltage gain of a differential amplifier are 48 dB and 2 dB	(C)

		respectively, then common mode rejection ratio is (A) 23 dB (B) 25 dB (C) 46 dB (D) 50 dB	
606	343	Generally, the gain of a transistor amplifier falls at high frequencies due to the (A) internal capacitances of the device (B) coupling capacitor at the input (C) skin effect (D) coupling capacitor at the output	(B)
606	344	Three identical amplifiers with each one having a voltage gain of 50, input resistance of 1kΩ and output resistance of 250Ω are cascaded. The opened circuit voltages gain of the combined amplifier is (A) 49 dB (B) 51 dB (C) 98 dB (D) 102 dB	(C)
606	345	Assume that the op-amp of the figure is ideal. If v_i is a triangular wave, then v_0 will be  (A) square wave (B) triangular wave (C) parabolic wave (D) sine wave	(A)
606	346	If the op-amp in the figure has an input offset voltage of 5 mV and an open-loop voltage gain of 10000, then v_0 will be  (A) 0 V (B) 5 mV (C) + 15 V or –15 V (D) +50 V or – 50 V	(C)
606	347	A dc power supply has a no-load voltage of 30 V, and a full-load voltage of 25 V at a full-load current of 1 A. Its output resistance and load regulation, respectively, are (A) 5 Ω and 20%	(B)

		(B) 25 Ω and 20% (C) 5 Ω and 16.7% (D) 25 Ω and 16.7%	
606	348	For full wave rectification, a four diode bridge rectifier is claimed to have the following advantages over a two diode circuit (1) less expensive transformer, (2) smaller size transformer, and (3) suitability for higher voltage application. Of these, (A) only (1) and (2) are true (B) only (1) and (3) are true (C) only (2) and (3) are true (D) (1), (2) as well as (3) are true	(D)
606	349	A zener diode in the circuit shown in the figure has a knee current of 5 mA, and a maximum allowed power dissipation of 300 mW. What are the minimum and maximum load currents that can be drawn safely from the circuit, keeping the output voltage V_0 constant at 6 V?  (A) 0 mA,180 mA (B) 5 mA,110 mA (C) 10 mA, 55 mA (D) 60 mA,180 mA	(C)
606	350	For small signal ac operation, a practical forward biased diode can be modelled as (A) a resistance and a capacitance in series (B) an ideal diode and resistance in parallel (C) a resistance and an ideal diode in series (D) a resistance	(C)
606	351	The output *Y* of a 2-bit comparator is logic 1 whenever the 2-bit input *A* is greater than the 2-bit input *B*. The number of combinations for which the output is logic 1, is (A) 4 (B) 6 (C) 8 (D) 10	(B)
606	352	The full form of the abbreviations TTL and CMOS in reference to logic families are (A) Triple Transistor Logic and Chip Metal Oxide Semiconductor (B) Tristate Transistor Logic and Chip Metal Oxide Semiconductor (C) Transistor Transistor Logic and Complementary Metal Oxide Semiconductor (D) Tristate Transistor Logic and Complementary Metal Oxide Silicon	(C)
606	353	What are the minimum number of 2- to -1 multiplexers required to generate a 2- input AND Gate and a 2-input Ex-OR gate (A) 1 and 2	(A)

		(B) 1 and 3 (C) 1 and 1 (D) 2 and 2	
606	354	X = 01110 and Y = 11001 are two 5-bit binary numbers represented in two's complement format. The sum of X and Y represented in two's complement format using 6 bits is (A) 100111 (B) 10000 (C) 101001 (D) correction in key	(C)
606	355	Decimal 43 in Hexadecimal and BCD number system is respectively (A) B2, 0100 011 (B) 2B, 0100 0011 (C) 2B, 0011 0100 (D) B2, 0100 0100	(B)
606	356	A digital system is required to amplify a binary-encoded audio signal. The user should be able to control the gain of the amplifier from minimum to a maximum in 100 increments. The minimum number of bits required to encode, in straight binary, is (A) 8 (B) 6 (C) 5 (D) 7	(D)
606	357	The minimum number of comparators required to build an 8-bits flash ADC is (A) 8 (B) 63 (C) 255 (D) 256	(C)
606	358	A 4 bit ripple counter and a bit synchronous counter are made using flip flops having a propagation delay of 10 ns each. If the worst case delay in the ripple counter and the synchronous counter be R and S respectively, then (A) R = 10 ns, S = 40 ns (B) R = 40 ns, S = 10 ns (C) R = 10 ns, S = 30 ns (D) R = 30 ns, S = 10 ns	(B)
606	359	4 - bit 2's complement representation of a decimal number is 1000. The number is (A) +8 (B) 0 (C) –7 (D) –8	(D)
606	360	An 8 bit successive approximation analog to digital communication has full scale reading of 2.55 V and its conversion time for an analog input of 1 V is 20 �s. The conversion time for a 2 V input will be (A) 10 �s	(B)

		(B) 20 �s (C) 40 �s (D) 50 �s	
606	361	The resolution of a 4-bit counting ADC is 0.5 volts. For an analog input of 6.6 volts, the digital output of the ADC will be (A) 1011 (B) 1101 (C) 1100 (D) 1110	(B)
606	362	Two 2's complement number having sign bits 'x' and 'y' are added and the sign bit of the result is z. Then, the occurrence of overflow is indicated by the Boolean function (A) xyz (B) $\overline{xyz}$ (C) $\overline{xy}z + xy\overline{z}$ (D) $xy + yz + zx$	(D)
606	363	The advantage of using a dual slope ADC in a digital voltmeter is that (A) its conversion time is small (B) its accuracy is high (C) it gives output in BCD format (D) it does not require a	(B)
606	364	A dynamic RAM cell which hold 5 V has to be refreshed every 20 m sec, so that the stored voltage does not fall by more than 0.5 V. If the cell has a constant discharge current of 1 pA, the storage capacitance of the cell is (A) 4×10^{-6} F (B) 4×10^{-9} F (C) 4×10^{-12} F (D) 4×10^{-15} F	(D)
606	365	A memory system of size 26 K bytes is required to be designed using memory chips which have 12 address lines and 4 data lines each. The number of such chips required to design the memory system is (A) 2 (B) 4 (C) 8 (D) 13	(D)
606	366	A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency which is not valid is (A) 5 kHz (B) 12 kHz	(A)

		(C) 15 kHz (D) 20 kHz	
606	367	The input $x(t)$ and output $y(t)$ of a system are related as $y(t) = \int_{-\infty}^{t} x(\tau) Cos\ (3cos(3\tau)\, d\tau$. The system is (A) time-invariant and stable (B) stable and not time-invariant (C) time-invariant and not stable (D) not time-invariant and not stable	(D)
606	368	A system is defined by its impulse response $h\ (n) = 2^n\ u\ (n-2)$. The system is (A) stable and causal (B) causal but not stable (C) stable but not causal (D) unstable and non-causal	(B)
606	369	The unit impulse response of a system is $f(t) = e^{-t}, t \geq 0$. For this system the steady-state value of the output for unit step input is equal to (A) –1 (B) 0 (C) 1 (D) ∞	(C)
606	370	The power in the signal $s\ (t) = 8\cos(20\pi - \frac{\pi}{2}) + 4\ \sin(15\pi t)$ is (A) 40 (B) 41 (C) 42 (D) 82	(A)
606	371	The Fourier transform of a conjugate symmetric function is always (A) imaginary (B) conjugate anti-symmetric (C) real (D) conjugate symmetric	(C)
606	372	The Laplace transform of $i(t)$ is given by $i(s) = \frac{2}{s(s+1)}$ $At\ t \to \infty$ the value of $i(t)$ becomes (A) 0 (B) 1 (C) 2	(C)

		(D) 3	
606	373	Convolution of $x(t+5)$ with impulse function $\partial(t-7)$ is equal to (A) $x(t-12)$ (B) $x(t+12)$ (C) $x(t-2)$ (D) $x(t+2)$	(C)
606	374	If a signal $f(t)$ has energy E, the energy of the signal $f(2t)$ is equal to (A) 1 (B) E/2 (C) 2E (D) 4E	(B)
606	375	A signal $x(t)$ has a Fourier transform X(ϖ). If $x(t)$ is a real and odd function of t, then X(ϖ) is (A) a real and even function of ϖ (B) a imaginary and odd function of ϖ (C) an imaginary and even function of ϖ (D) a real and odd function of ϖ	(A)
606	376	The return loss of a device is found to be 20 dB. The voltage standing wave ratio (VSWR) and magnitude of reflection coefficient are respectively (A) 1.22 and 0.1 (B) 0.81 and 0.1 (C) – 1.22 and 0.1 (D) 2.44 and 0.2	(A)
606	377	A plane wave propagating in air with $E(8a_x+6a_y+5a_z)e^{j(\omega t+3x-4y)}$ V/m is incident on a perfectly conducting slab positioned at $x\leq0$. The E field of the reflected wave is (A) $(-8a_x-6a_y-5a_z)e^{j(\omega t+3x+4y)}$ V/m (B) $(-8a_x+6a_y-5a_z)e^{j(\omega t+3x+4y)}$-V/m (C) $(-8a_x-6a_y-5a_z)e^{j(\omega t-3x-4y)}$ V/m (D) $(-8a_x+6a_y-5a_z)e^{j(\omega t-3x-4y)}$ V/m	(C)
606	378		(A)

		The radiation pattern of an antenna in spherical co-ordinates is given by $F(\theta)=\cos^4\theta$; $0 \le \theta \le \pi/2$. The directivity of the antenna is (A) 10 dB (B) 12.6 dB (C) 11.5 dB (D) 18 dB	
606	379	A transmission line with a characteristic impedance of 100 Ω is used to match a 50 Ω section to a 200 Ω section. If the matching is to be done both at 429MHz and 1GHz, the length of the transmission line can be approximately (A) 82.5 cm (B) 1.05m (C) 1.58 cm (D) 1.75m	(C)
606	380	A transmission line of characteristic impedance 50Ω is terminated by a 50Ω load. When excited by a sinusoidal voltage source at 10 GHz, the phase difference between two points spaced 2 mm apart on the line is found to be π/4 radians. The phase velocity of the wave along the line is (A) 0.8 � 10^8m/s (B) 1.2 � 10^8m/s (C) 1.6 � 10^8m/s (D) 3 � 10^8m/s	(C)
606	381	A transmission line has a characteristic impedance of 50 Ω and a resistance of 0.1 Ω /m. If the line is distortion less, the attenuation constant (in Np/m) is (A) 500 (B) 5 (C) 0.014 (D) 0.002	(D)
606	382	The electric field component of a time harmonic plane EM wave traveling in a nonmagnetic lossless dielectric medium has an amplitude of 1 V/m. If the relative permittivity of the medium is 4, the magnitude of the time-average power density vector (in W/m2) is (A) $\frac{1}{30\pi}$ (B) $\frac{1}{60\pi}$ (C) $\frac{1}{120\pi}$ (D) $\frac{1}{240\pi}$	(C)
606	383	For a Hertz dipole antenna, the half power beam width (HPBW) in the *E*-plane is (A) 360^o (B) 180^o	(C)

		(C) 90^o (D) 45^o	
606	384	A uniform plane wave in the free space is normally incident on an infinitely thick dielectric slab (dielectric constant Ɛ = 9). The magnitude of the reflection coefficient is (A) 0 (B) 0.3 (C) 0.5 (D) 0.8	(C)
606	385	In the design of a single mode step index optical fibre close to upper cut-off, the single-mode operation is not preserved if (A) radius as well as operating wavelength are halved (B) radius as well as operating wavelength are doubled (C) radius is halved and operating wavelength is doubled (D) radius is doubled and operating wavelength is halved	(B)
606	386	The electric field of an electromagnetic wave propagation in the positive direction is given by $E=\hat{a}_x \sin(\omega t-\beta z)+\hat{a}_y \sin(\omega t-\beta z+\pi/2)$. The wave is (A) Linearly polarized in the *z*–direction (B) Elliptically polarized (C) Left-hand circularly polarized (D) Right-hand circularly polarized	(C)
606	387	A transmission line is feeding 1 watt of power to a horn antenna having a gain of 10 dB. The antenna is matched to the transmission line. The total power radiated by the horn antenna into the free space is (A) 10 Watts (B) 1 Watts (C) 0.1 Watts (D) 0.01 Watt	(A)
606	388	A rectangular wave guide having TE_{10} mode as dominant mode is having a cut off frequency 18 GHz for the mode TE_{30}. The inner broad-wall dimension of the rectangular wave guide is (A) 5/3 cm (B) 5 cm (C) 5/2 cm (D) 10cm	(C)
606	389	Refractive index of glass is 1.5. Find the wavelength of a beam of light with frequency of 1014 Hz in glass. Assume velocity of light is 3 � 108 m/s in vacuum (A) 3 �*m* (B) 3 mm (C) 2 �*m* (D) 1 mm	(C)
606	390	Consider a lossless antenna with a directive gain of +6 dB. If 1 mW of power is fed to it the total power radiated	(A)

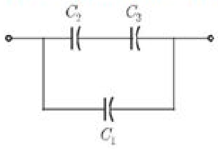
		by the antenna will be (A) 4 mW (B) 1 mW (C) 7 mW (D) 1/4 mW	
606	391	A plane electromagnetic wave propagating in freespace is incident normally on a large slab of loss-less, non-magnetic, dielectric material with Ɛ > Ɛ0. Maxima and minima are observed when the electric field is measured in front of the slab. The maximum electric field is found to be 5 times the minimum field. The intrinsic impedance of the medium should be (A) 120 $\pi\Omega$ (B) 60 $\pi\Omega$ (C) 600 $\pi\Omega$ (D) 24 $\pi\Omega$	(D)
606	392	The depth of penetration of electromagnetic wave in a medium having conductivity ‘σ’at a frequency of 1 MHz is 25 cm. The depth of penetration at a frequency of 4 MHz will be (A) 6.25 dm (B) 12.50 cm (C) 50.00 cm (D) 100.00 cm	(B)
606	393	A uniform plane wave traveling in air is incident on the plane boundary between air and another dielectric medium with $\mathcal{E}_r$= 4. The reflection coefficient for the normal incidence, is (A) Zero (B) 0.5 ∠180. 0 (C) 0.333 ∠0. 0 (D) 0.333 ∠180. 0	(D)
606	394	The VSWR can have any value between (A) 0 and 1 (B) –1 and +1 (C) 0 and ∞ (D) 1 and ∞	(D)
606	395	A person with receiver is 5 Km away from the transmitter. What is the distance that this person must move further to detect a 3-dB decrease in signal strength? (A) 942 m (B) 2070 m (C) 4978 m (D) 5320 m	(B)
606	396	A material has conductivity of 10^{-2}mho/m and a relative permittivity of 4. The frequency at which the conduction current in the medium is equal to the displacement current is (A) 45 MHz (B) 90 MHz	(A)

		(C) 450 MHz (D) 900 MHz	
606	397	A uniform plane electromagnetic wave incident on a plane surface of a dielectric material is reflected with a VSWR of 3. What is the percentage of incident power that is reflected? (A) 0.1 (B) 0.25 (C) 0.5 (D) 0.75	(B)
606	398	The depth of penetration of wave in a lossy dielectric increases with increasing (A) conductivity (B) permeability (C) wavelength (D) permittivity	(C)
606	399	Some unknown material has a conductivity of 10^6 mho/m and a permeability of $4\pi\times10^{-7}$ H/m . The skin depth for the material at 1GHz is (A) 15.9 �m (B) 20.9 �m (C) 25.9 �m (D) 30.9 �m	(A)
606	400	A lossless transmission line having 50Ω characteristic impedance and length $\lambda/4$ is short circuited at one end and connected to an ideal voltage source of 1 V at the other end. The current drawn from the voltage source is (A) 0 (B) 0.02 A (C) ∞ (D) None of the above	(A)
606	401	If $R(\zeta)$ is the auto correlation function of a real, wide-sense stationary random process, then which of the following is NOT true (A) $R(\zeta) = R(-\zeta)$ (B) $R(\zeta) \le R(0)$ (C) $R(\zeta) = -R(-\zeta)$ (D) The mean square value of the process is $R(0)$	(C)
606	402		(B)

		If $S(f)$ is the power spectral density of a real, wide-sense stationary random process, then which of the following is ALWAYS true? (A) $S(0) \leq S(f)$ (B) $S(f) \geq 0$ (C) $S(-f) = -S(f)$ (D) $\int_{-\infty}^{\infty} S(f)df = 0$	
606	403	If E denotes expectation, the variance of a random variable X is given by (A) $E[X^2] - E^2[X]$ (B) $E[X^2] + E^2[X]$ (C) $E[X^2]$ (D) $E^2[X]$	(A)
606	404	A zero-mean white Gaussian noise is passes through an ideal low pass filter of bandwidth 10 kHz. The output is then uniformly sampled with sampling period ts = 0.03 msec. The samples so obtained would be (A) correlated (B) statistically independent (C) uncorrelated (D) orthogonal	(A)
606	405	A 1 mW video signal having a bandwidth of 100 MHz is transmitted to a receiver through cable that has 40 dB loss. If the effective one-side noise spectral density at the receiver is 10^{-20} Watt/Hz, then the signal-to-noise ratio at the receiver is (A) 50 dB (B) 30 dB (C) 40 dB (D) 60 dB	(A)
606	406	Two sinusoidal signals of same amplitude and frequencies 10 kHz and 10.1 kHz are added together. The combined signal is given to an ideal frequency detector. The output of the detector is (A) 0.1 kHz sinusoid (B) 20.1 kHz sinusoid (C) a linear function of time (D) a constant	(A)
606	407	The noise at the input to an ideal frequency detector is white. The detector is operating above threshold. The power spectral density of the noise at the output is (A) raised-cosine (B) flat (C) parabolic (D) Gaussian	(C)

606	408	Let X and Y be two statistically independent random variables uniformly distributed in the ranges $(-1,1)$ and $(-2,1)$ respectively. Let $Z = X + Y$. Then the probability that $(z \leq -1)$ is (A) zero (B) $\frac{1}{6}$ (C) $\frac{1}{3}$ (D) $\frac{1}{12}$	(D)
606	409	Let Y and Z be the random variable obtained by sampling $X(t)$ at $t = 2$ and $t = 4$ respectively. Let $W = Y - Z$. The variance of W is (A) 13.36 (B) 9.36 (C) 2.64 (D) 8	(C)
606	410	The line-of-sight communication requires the transmit and receive antennas to face each other. If the transmit antenna is vertically polarized, for best reception the receiver antenna should be (A) horizontally polarized (B) vertically polarized (C) at 45^{o} with respect to horizontal polarization (D) at 45^{o} with respect to vertical polarization	(B)
606	411	A band-limited signal with a maximum frequency of 5 kHz is to be sampled. According to the sampling theorem, the sampling frequency, which is not valid, is (A) 5 kHz (B) 12 kHz (C) 15 kHz (D) 20 kHz	(A)
606	412	The PDF of a Gaussian random variable X is given by $p_x(X) = \frac{1}{3\sqrt{2\pi}} e^{\frac{(x-4)^2}{18}}$. The probability of the event $\{X = 4\}$ is (A) $\frac{1}{2}$ (B) $\frac{1}{3\sqrt{2\pi}}$ (C)	(A)

		0 (D) $\frac{1}{4}$	
606	413	The amplitude spectrum of a Gaussian pulse is (A) uniform (B) a sine function (C) Gaussian (D) an impulse function	(C)
606	414	The Fourier transform of a voltage signal $x(t)$ is $X(f)$. The unit of $X(f)$ is (A) volt (B) volt-sec (C) volt/sec (D) $\text{vol}t^2$	(A)
606	415	The auto correlation function of an energy signal has (A) no symmetry (B) conjugate symmetry (C) odd symmetry (D) even symmetry	(D)
606	416	If x=$\sqrt{-1}$, then the value of x^x is (A) $e^{-\pi/2}$ (B) $e^{\pi/2}$ (C) x (D) 1	(A)
606	417	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 (A) 2/36 (B) 2/6 (C) 5/12 (D) �	(D)
606	418	The order of the differential equation $\frac{d^2y}{dt} + (\frac{dy}{dt})^3 + y^4 = e^{-t}$ is (A) 1 (B) 2	(B)

		(C) 3 (D) 4	
606	419	The system of linear equations $4x + 2y = 7$ $2x + y = 6$ Has (A) a unique solution (B) no solution (C) an infinite number of solutions (D) exactly two distinct solutions	(B)
606	420	A probability density function is of the form $p(x) = Ke^{-\alpha(x)}, x \in (-\infty, \infty)$. The value of K is (A) 0.5 (B) 1 (C) 0.5a (D) a	(C)
606	421	Three Capacitors C_1,C_2 and C_3 whose values are 10 μF, 5μF, 2μF respectively have breakdown 10V, 5V and 2V respectively.For the interconnection shown below the maximum safe voltage in Volts that can be applied across the combination, and the corresponding total charge in μC stored in the effective capacitance across the terminals are respectively  (A) 2.8 and 36 (B) 7 and 119 (C) 2.8 and 32 (D) 7 and 80	(C)
606	422	The average power delivered to an impedance (4-j3)Ω by a current 5 cos(100pt + 100) A is (A) 44.2W (B) 50W (C) 62.5W (D) 125W	(B)
606	423	In a series RLC circuit, R = 2 kΩ, L= 1 H, and C =1/400μF. The resonant frequency is (A) 2×10^4Hz (B) $1/\pi \times 10^4$Hz	(B)

		(C) 10^4Hz (D) $2\pi \times 10^4$Hz	
606	424	The first and the last critical frequency of an *RC* -driving point impedance function must respectively be (A) a zero and a pole (B) a zero and a zero (C) a pole and a pole (D) a pole and a zero	(C)
606	425	A source of angular frequency 1 rad/sec has a source impedance consisting of 1Ω resistance in series with 1 H inductance. The load that will obtain the maximum power transfer is (A) 1 Ω resistance (B) 1 Ω resistance in parallel with 1 H inductance (C) 1 Ω resistance in series with 1 F capacitor (D) 1 Ω resistance in parallel with 1 F capacitor	(C)
606	426	A series RLC circuit has a resonance frequency of 1khz and a quality factor Q=100, If each of R,L and C is doubled from its original value, the new Q of the circuit is (A) 25 (B) 50 (C) 100 (D) 200	(B)
606	427	The short-circuit admittance matrix a two-port network is $\begin{bmatrix} 0 & -1/2 \\ 1/2 & 0 \end{bmatrix}$. The two-port network is (A) non-reciprocal and passive (B) non-reciprocal and active (C) reciprocal and passive (D) reciprocal and active	(B)
606	428	In IC technology, dry oxidation (using dry oxygen) as compared to wet oxidation (using steam or water vapor) produces (A) superior quality oxide with a higher growth rate (B) inferior quality oxide with a higher growth rate (C) inferior quality oxide with a lower growth rate (D) superior quality oxide with a lower growth rate	(D)
606	429	The source of a silicon (n_i=10^{10}per cm^3)n-channel MOS transistor has an area Of 1 sq.mm and a depth of 1μm. If the dopant density in the source is 10^{19}/cm^3, the number of holes in the source region with the above volume is approximately (A) 10^7 (B) 100	(D)

		(C) 10 (D) 0	
606	430	Drift current in the semiconductors depends upon (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	(C)
606	431	A Zener diode, when used in voltage stabilization circuits, is biased in (A) reverse bias region below the breakdown voltage (B) reverse breakdown region (C) forward bias region (D) forward bias constant current mode	(B)
606	432	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 (A) increases by 60 mV (B) decreases by 60 mV (C) increases by 25 mV (D) decreases by 25 mV	(D)
606	433	At room temperature, a possible value for the mobility of electrons in the inversion layer of a silicon n-channel MOSFET is (A) 450 cm^2 /V–s (B) 1350 cm^2 /V–s (C) 1800 cm^2 /V–s (D) 3600 cm^2 /V–s	(A)
606	434	Thin gate oxide in a CMOS process is preferably grown using (A) wet oxidation (B) dry oxidation (C) epitaxial oxidation (D) ion implantation	(B)
606	435	Compared to a p-n junction with $NA = ND = 10^{14}\ /cm^3$, which one of the following statements is TRUE for a p-n junction with $NA = ND = 10^{20}\ /cm^3$? (A) Reverse breakdown voltage is lower and depletion capacitance is lower (B) Reverse breakdown voltage is higher and depletion capacitance is lower (C) Reverse breakdown voltage is lower and depletion capacitance is higher (D) Reverse breakdown voltage is higher and depletion capacitance is higher	(C)
606	436	In an n-type silicon crystal at room temperature, which of the following can have a concentration of $4 \times 10^{19}\ /cm^{-3}$?	(C)

		(A) Silicon atoms (B) Holes (C) Dopant atoms (D) Valence electrons	
606	437	The ratio of the mobility to the diffusion coefficient in a semiconductor has the units (A) *V*–1 (B) cm. *V*1 (C) *V*.cm–1 (D) *V*. *s*	(A)
606	438	A silicon wafer has 100nm of oxide on it and is furnace at a temperature above 1000^{o}C for further oxidation. The oxidation rate (A) is independent of current oxide thickness and temperature (B) is independent of current oxide thickness but depends on temperature (C) slows down as the oxide grows (D) is zero as the existing oxide prevents further oxidation	(D)
606	439	The concentration of minority carriers in an extrinsic semiconductor under equilibrium is (A) Directly proportional to doping concentration (B) Inversely proportional to the doping concentration (C) Directly proportional to the intrinsic concentration (D) Inversely proportional to the intrinsic concentration	(A)
606	440	A heavily doped n-type semiconductor has the following data: Hole-electron ratio : 0.4 Doping concentration : 4.2×10^8atoms/m^3 Intrinsic concentration : 1.5×10^4atoms/m^3 The ratio of conductance of the n-type semiconductor to that of the intrinsic semiconductor of same material and at same temperature is given by (A) 5.0E-5 (B) 2000 (C) 10000 (D) 20000	(D)
606	441	For a BJT, the common base current gain α = 0.98 and the collector base junction reverse bias saturation current ICO = 0.6 μA. This BJT is connected in the common emitter mode and operated in the active region with a base drive current IB = 20 μA. The collector current IC for this mode of operation is (A) 0.98 mA (B) 0.99 mA (C) 1.0 mA (D) 1.01 mA	(D)
606	442	For small increase in *VG* beyond 1V, which of the following gives the correct description of the region of	(D)

		operation of each MOSFET (A) Both the MOSFETs are in saturation region (B) Both the MOSFETs are in triode region (C) n-MOSFETs is in triode and *p* -MOSFET is in saturation region (D) n- MOSFET is in saturation and *p* -MOSFET is in triode region	
606	443	The input impedance (*Zi*) and the output impedance (*Z*0) of an ideal transconductance voltage controlled current source amplifier are (A) *Zi*= 0, *Z*0 = 0 (B) *Zi*= 0, *Z*0 = ∞ (C) *Zi*= ∞, *Z*0 = 0 (D) *Zi*= ∞, *Z*0 = ∞	(D)
606	444	An n-channel depletion MOSFET has following two points on its I_D-V_{GS} curve: (i) V_{GS}= 0 at I_D= 12 mA and (ii) V_{GS}=- 6 Volts at I_D= 0 mA Which of the following *Q* point will given the highest trans conductance gain for small signals? (A) $V_{GS}=-6$ Volts (B) $V_{GS} = -3\ Volts$ (C) $V_{GS} = 0Volts$ (D) $V_{GS} = 3\ Volts$	(C)
606	445	If β *DC* is increased by 10%, the collector-to-emitter voltage drop (A) increases by less than or equal to 10% (B) decreases by less than or equal to 10% (C) increase by more than 10% (D) decreases by more than 10%	(B)
606	446	In a full-wave rectifier using two ideal diodes, V_{dc} and V_m are the dc and peak values of the voltage respectively across a resistive load. If *PIV* is the peak inverse voltage of the diode, then the appropriate relationships for this rectifier are (A) $V_{dc} = \frac{V_m}{\pi}$, PIV =$2V_m$ (B) $I_{dc} = 2\frac{V_m}{\pi}$, PIV =$2V_m$ (C) $V_{dc} = 2\frac{V_m}{\pi}$, PIV =V_m (D) $V_{dc} = \frac{V_m}{\pi}$, PIV =V_m	(B)
606	447	An amplifier without feedback has a voltage gain of 50, input resistance of 1 k Ω and output resistance of 2.5 kΩ. The input resistance of the current-shunt negative feedback amplifier using the above amplifier with a feedback factor of 0.2, is	(A)

		(A) $\frac{1}{11}$ kΩ (B) $\frac{1}{5}$ kΩ (C) 5 kΩ (D) 11 kΩ	
606	448	Introducing a resistor in the emitter of a common amplifier stabilizes the dc operating point against variations in (A) only the temperature (B) only the β of the transistor (C) both temperature and β (D) none of the above	(C)
606	449	Crossover distortion behavior is characteristic of (A) Class A output stage (B) Class B output stage (C) Class AB output stage (D) Common-base output stage	(D)
606	450	In standing wave pattern on a transmission line (A) voltage and current nodes coincide (B) voltage nodes and current antinodes as well as current nodes and voltage antinodes coincide (C) voltage and current antinode coincide (D) both (A) and (C)	(D)