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Note : Attempt all the twenty questions. Each question carries 2 marks. Answer should not exceed 15 words.

1 Define Fermi-Dirac energy distribution.

2 What is Hall Effect ?

3 Differentiate between Field effect transistors and Bipolar junction transistor.



4 What is forward blocking voltage of an SCR ?

5 Given the following facts about a sequence $x[n]$:

(a) $x[n]$ is periodic with period $N=6$

(b)
$$\sum_{n=0}^5 x[n] = 2$$

(c)
$$\sum_{n=2}^7 (-1)^n x[n] = 1$$

(d) $x[n]$ has the minimum power per period among the set of signals satisfying the preceding three conditions.

Determine the sequence $x[n]$.



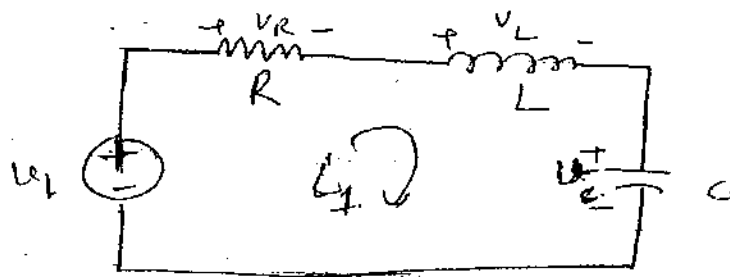
6 Whether $x_1(t) = 2e^{j(t+\pi/4)}u(t)$ is a periodic signal ?

7 Plot the impulse response of a low pass filter $h(t) = (1/\pi t) \sin \omega_c t$

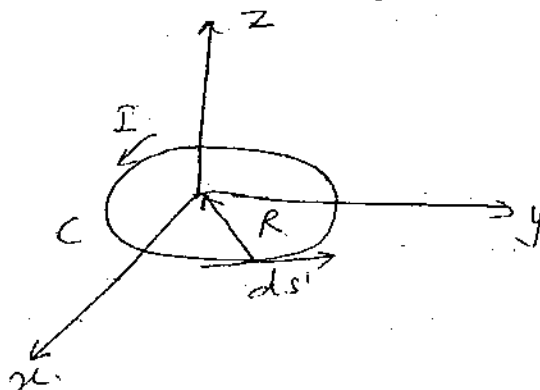
8 What will be z-transform of $s(n) = \delta(n)$?



11 Determine the steady state response of the following network if $v_1 = \cos \omega t$.



12 Find the field at the center of a circular loop shown below :

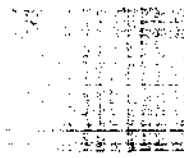




13 The cross section of a rectangular wave guide is 2 cm in width and 1 cm in height. What will be the cut-off frequency of this wave guide ?

14 What is micro-strip line and what is the use of it ?

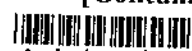
15 How do you differentiate between accuracy and preciseness ?



16 What is the application of Wein's Bridge ?

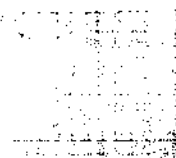
17 What are basic measurements available in a multi-meter ?

18 A moving-coil instrument has a resistance of $10\ \Omega$ and gives a full scale deflection when carrying a current of 50 mA. Show how it can be adopted to measure voltage upto 750 V and current upto 1000 A.



19 Find the Laplace transform of $x(t) = te^{-at}u(t)$

20 The disc of an energy meter makes 600 revolutions per unit of energy. When a 1000 watt load is connected, the disc rotates at 10.2 rps if the load is on for 12 hours, how many units are recorded as error ?



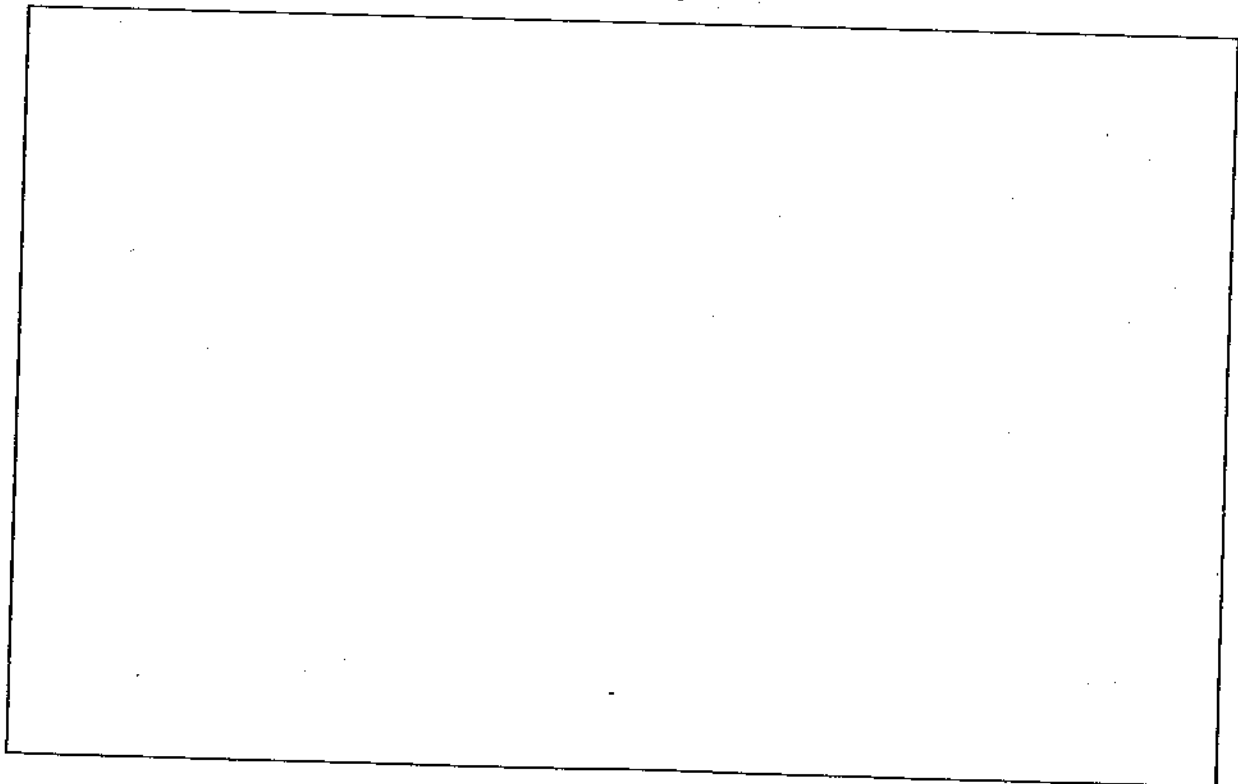
PART - B

Marks : 60

Note : Attempt all the twelve questions. Each question carries 5 marks. Answer should not exceed 50 words.

21 What is Gunn Effect ? Give V-I characteristics of GUNN diode.

22 Sketch a CMOS inverter and explain its operation.

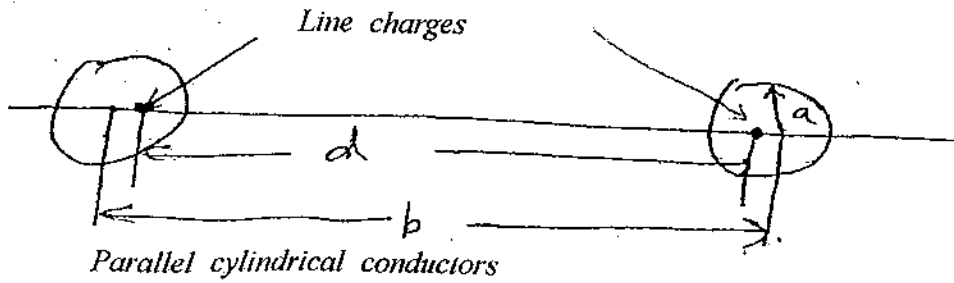


23 What is PIN photodiode ? How does it differ from Avalanche photodiode ? Give the expression for photocurrent density.



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- 24 A pair of line charges, appropriately located, would make the surfaces occupied by the parallel cylindrical conductors equipotentials. If the radius of the cylinders is "a" and the separation between their axes is "b", then determine the capacitance per unit length.



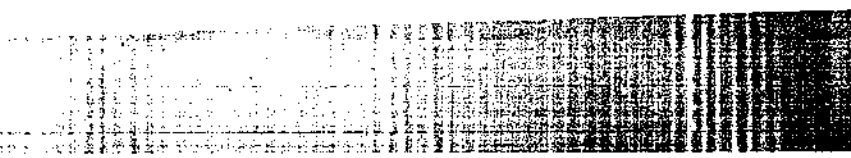


25 Following two signals $x(t)$ and $h(t)$ are available. Find convolution integral $y(t)$.

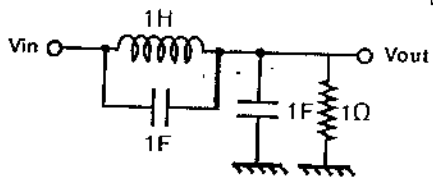
$$x(t) = e^{2t}u(-t)$$

$$h(t) = u(t-3)$$

26 Give details of a two elements array of non-directional radiators.



27 Draw pole-zero plot of following circuit :



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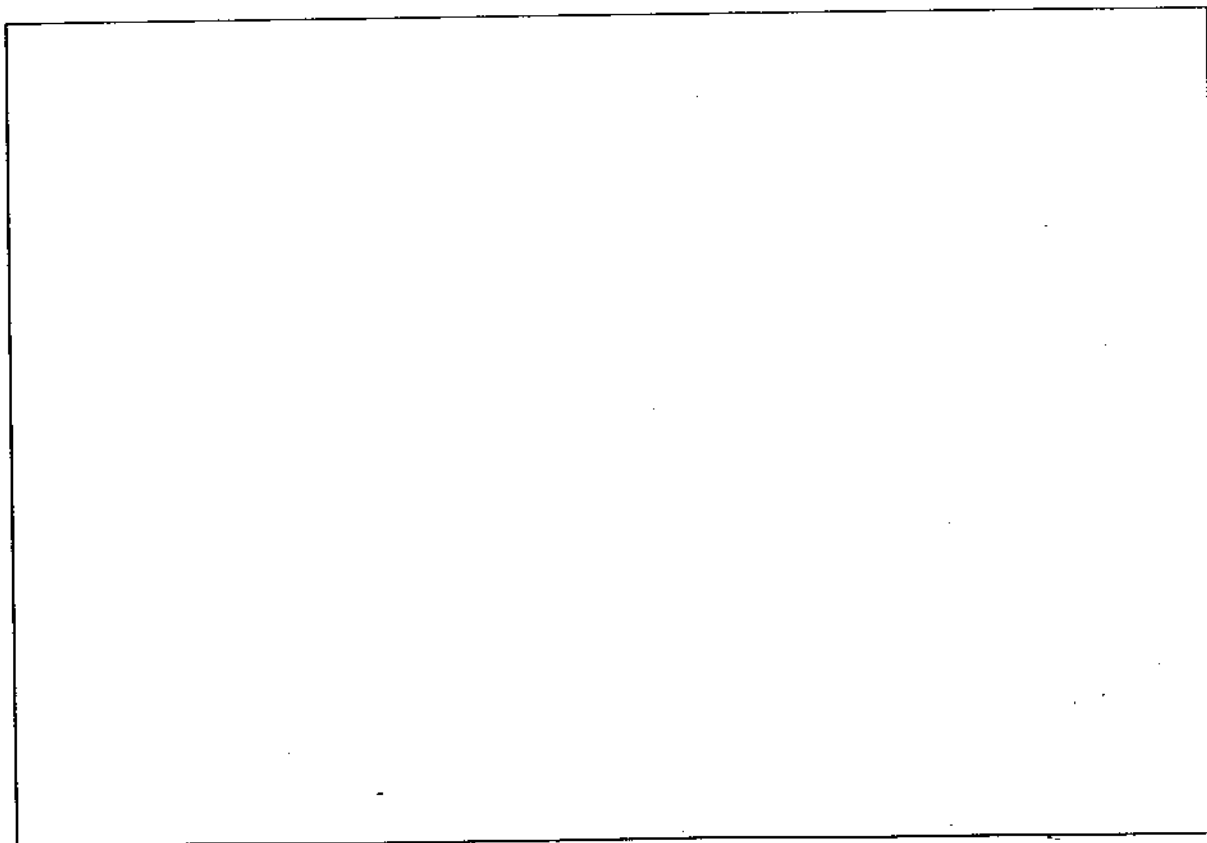
28 What are the types of passive matching networks ? List the advantages of impedance matching.

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29 List advantages of Rhombic antennas.

30 Give the circuit of Hay's bridge for measurement of inductance.



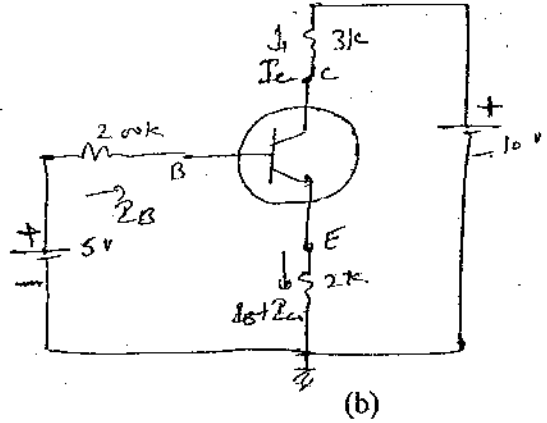
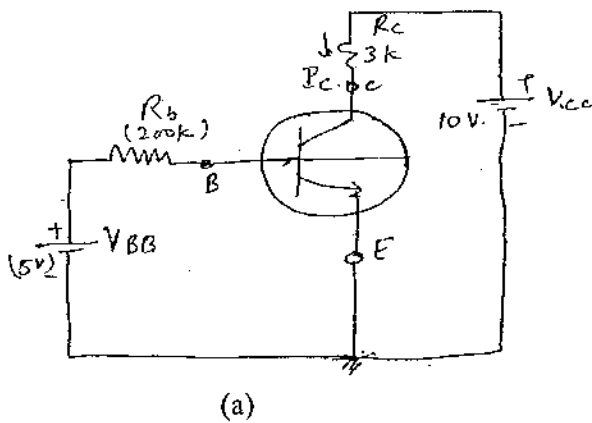
- 31 A half wave dipole radiator is elevated 100 ft above the ground. A receiving dipole 3 miles distant is elevated 30 ft. Determine the space and surface wave field strengths at the receiving antenna when the transmitting antenna carries a current of 1 ampere at a frequency of 50 MHz. Assume an average earth having $\epsilon_r=15$ and $\sigma=5\times 10^{-3}$ for vertical half wave dipoles.

- 32 List the causes of errors in digital frequency counters used for time interval measurement.



Note : Attempt any 5 questions. Each question carries 20 marks. Answer should not exceed 200 words.

- 33 (a) Find the transistor currents in the circuit shown below. A silicon transistor with $\beta = 100$ and $I_{CO} = 20$ nA is under consideration
 (b) Repeat part (a), if a 2 K emitter resistor is added to the circuit as shown below.



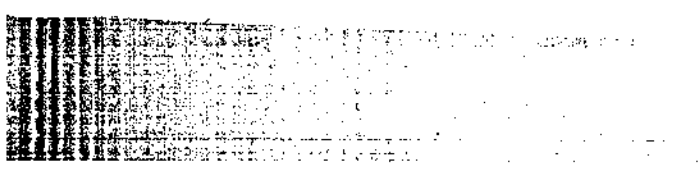




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35 Autocorrelation function of a stationary random process $X(t)$ is :

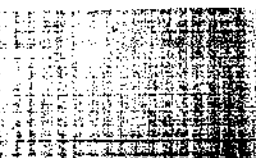
$$R_x(\tau) = \sigma^2 e^{-\mu|\tau|}$$

where μ and σ^2 are constants. It is passed through a filter whose impulse response is :

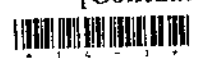
$$h(\tau) = \alpha e^{-\alpha\tau} u(\tau)$$

where α and $u(\tau)$ is a step function.

Determine the power spectral density of random signal $X(t)$ and of the output random signal $Y(t)$.



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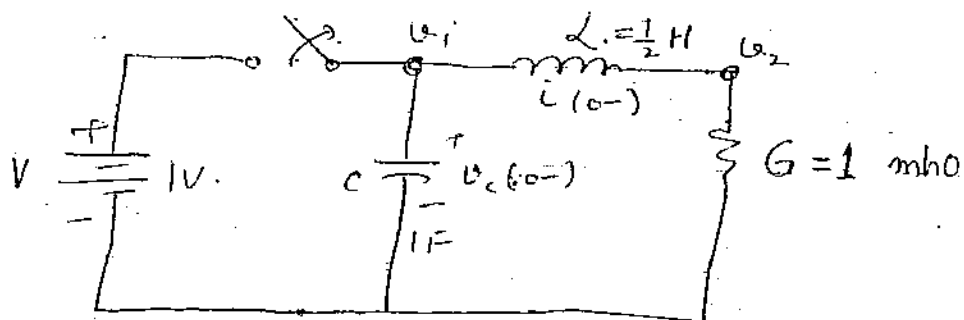


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- 39 Consider the network shown. At $t=0$ the switch is opened, find the node voltages $v_1(t)$ and $v_2(t)$ for the circuit.







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