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## Subject: ELECTRONIC DEVICES AND CIRCUITS

**Time: 3 Hours** **Max. Marks: 10**

## DECEMBER 2010

**NOTE: There are 9 Questions in all.**

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after half an hour of the commencement of the examination.**
- **Out of the remaining EIGHT Questions, answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. The dual of given network in Fig.1 is

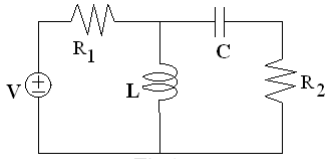
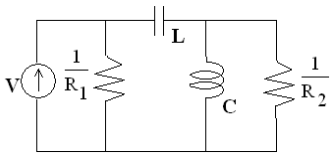
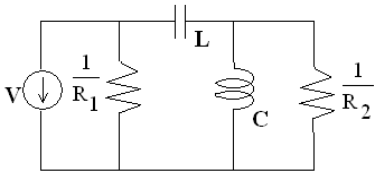
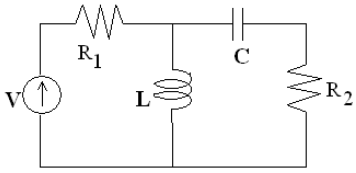
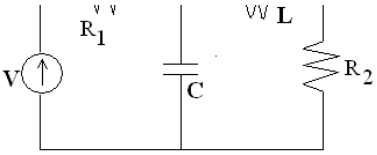


Fig.1

**(A)** 


**(B)** 


**(C)** 


**(D)** 


b. The for maximum power transfer in the given circuit (Fig.2) is

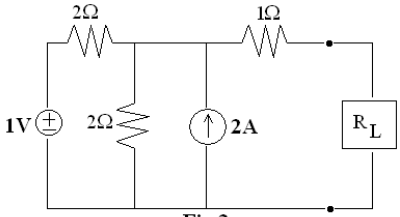


Fig.2

**(A)** 3Ω **(B)** 1Ω
**(C)** 0Ω **(D)** cannot be determined

c. The V-I characteristic curve of circuit shown in Fig.3 is

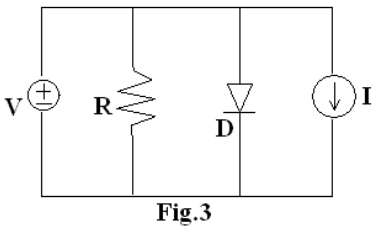
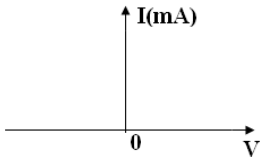
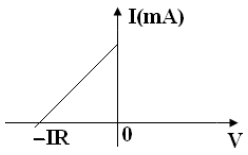
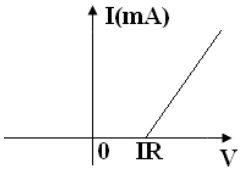
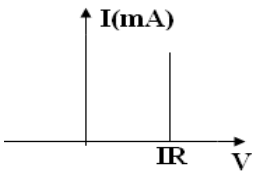


Fig.3

**(A)** 


**(B)** 


**(C)** 


**(D)** 

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d. If $V_m$ is the peak AC voltage of one-half of transformer secondary then PI
full wave rectifier with centre-tapped transformer is

**(A)** $\frac{V_m}{2}$ **(B)** $V_m$

**(C)** $2V_m$ **(D)** 1.11

e. The amplification factor $(\mu)$ of JFET is equal to

**(A)** $\frac{g_m}{r_d}$ **(B)** $g_m r_d$

**(C)** $\sqrt{g_m r_d}$ **(D)** $\sqrt{\frac{r_d}{g_m}}$

f. The maximum efficiency of class B push pull power amplifier is

**(A)** $\frac{\pi}{2}$ **(B)** $\frac{\pi}{\sqrt{2}}$

**(C)** $\frac{\pi}{2\sqrt{2}}$ **(D)** $\frac{\pi}{4}$

g. In negative feedback amplifier, identify false statements

**(A)** BW increases **(B)** gain increases
**(C)** noise reduces **(D)** stability improves

h. In multistage amplifier,

**(A)** Gain increases and BW increases
**(B)** Gain decreases and BW increases
**(C)** Gain decreases and BW decreases
**(D)** Gain increases and BW decreases

i. Emitter follower has

**(A)** high input impedance and high output impedance
**(B)** high input impedance and low output impedance
**(C)** low input impedance and high output impedance
**(D)** low input impedance and low output impedance

j. In Wein bridge oscillator, frequency of oscillation is

**(A)** $2\pi RC$ **(B)** $\frac{1}{2\pi RC}$

**(C)** $\frac{1}{2\pi RC\sqrt{6}}$ **(D)** $\frac{1}{2\pi\sqrt{LC}}$



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**Answer any FIVE Questions out of EIGHT Questions.**
**Each question carries 16 marks.**

**Q.2** a. State and explain the Thevenin's Theorem. Also explain how we get Norton's equivalent from Thevenin's equivalent of a circuit. **(4)**

b. Determine the V and I in the given Circuit (Fig.4) **(4)**

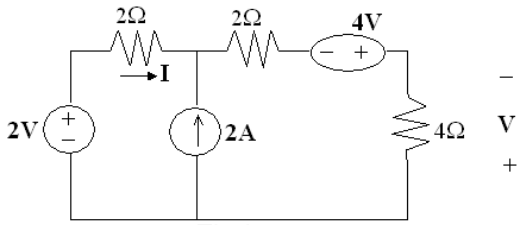


Fig.4

c. State Miller's [illegible] **(8)**

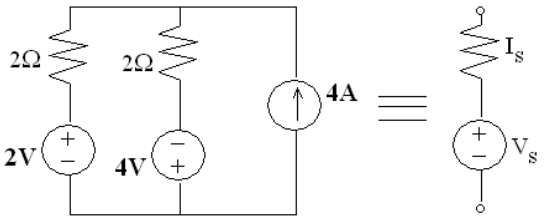


Fig.5

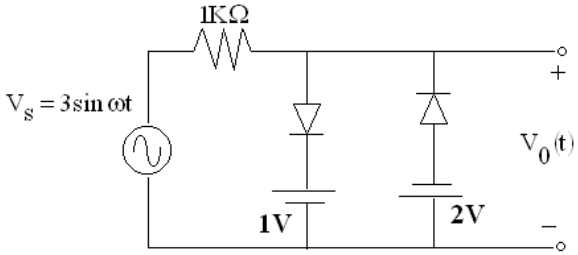


Fig.6

**Q.3** a. Sketch $v_0(t)$ as shown in Fig.6 a

b. Using ideal diode, design a clamper circuit to perform the function indicated in the Fig.7. **(6)**

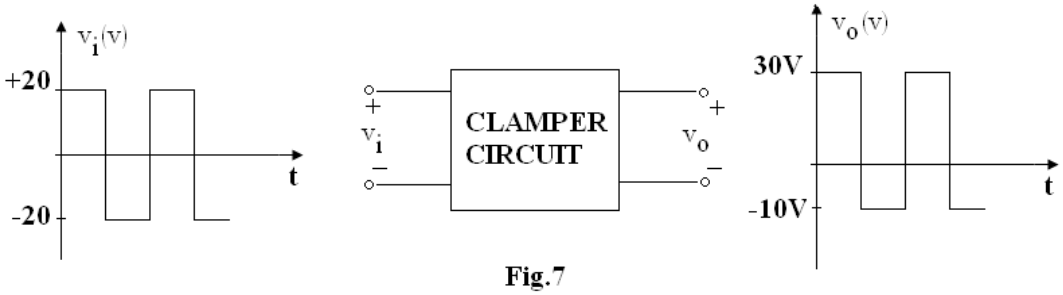


Fig.7

(i) $R_L = 100K\Omega$ (ii) $R_L = 10K\Omega$ **(6)**

(iii) $R_L = 1K\Omega$

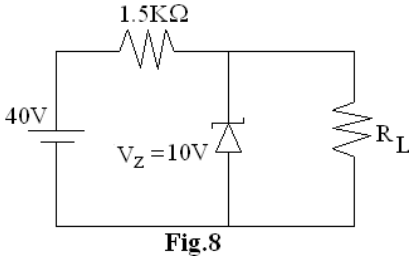


Fig.8

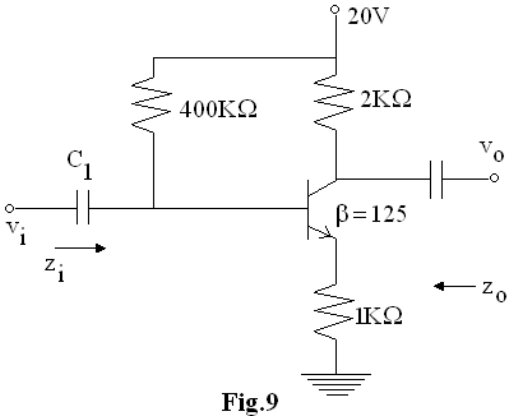


Fig.9

**Q.4** a.

(i) Draw AC equivalent circuit diagram.



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(ii) Calculate $A_V$, $A_I$, $Z_i$ and $Z_0$.

b. Explain the need of biasing in Transistor circuit and describe self bias technique. **(8)**

**Q.5** a. What is Power Amplifier? Compare Class A, Class B, Class AB and Class C Power Amplifiers. **(8)**

b. For the Amplifier circuit shown in Fig.10.
$V_{CC} = 15V, \beta = 40, I_{CQ} = 5mA, V_{CEQ} = 7.5V$

(i) Estimate the value of $R_L$

(ii) Specify $I_{BQ}$

(iii) For a swing in $i_C$ from 0mA to 10mA.
Find AC power output and efficiency.
What is the corresponding swing in $i_B$. **(8)**

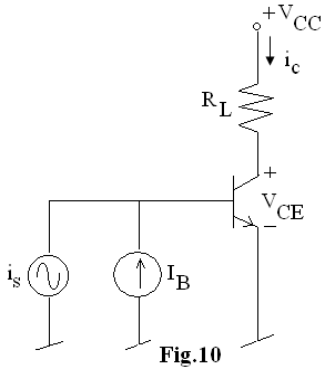

Fig.10

**Q.6** a. Explain Barkhausen criterion for sustained oscillation. In the given block diagram (Fig.11), determine the value of C for system to be oscillatory. **(8)**

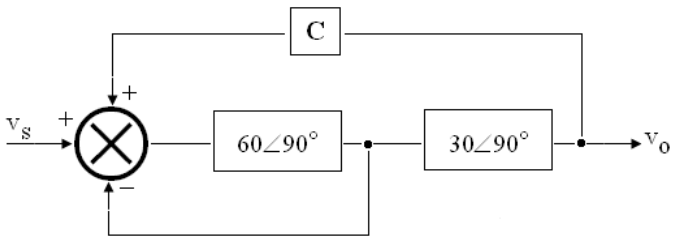

Fig.11

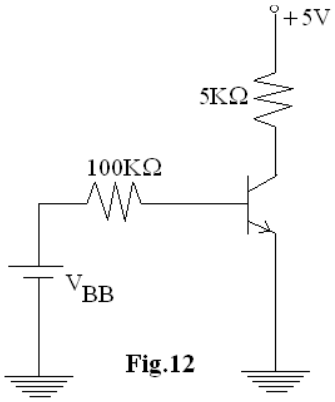

Fig.12

b. Explain Wein's bridge oscillator. Deduc n for sustained oscillation. **(8)**

**Q.7** a. Explain the frequency response curve of single stage RC coupled amplifier. Compare it with two stage RC coupled amplifier. **(5)**

b. Write short note on Darlington Amplifier. Also discuss its merits and demerits. **(5)**

c. Explain multistage amplifier and its different cascade connections. **(6)**

**Q.8** a. The JFET to be operated at an operating point defined by
$I_D = 3mA, V_{DS} = 12V, V_{GS} = -3V, V_{DD} = 36V$
Design an approximate biasing circuit. Assume $V_{GG} = 12V$, $R_G = 12M\Omega$. **(8)**

b. For the Transistor in Fig.12 find the range of $V_{BB}$ for Transistor to be in
(i) Cut-off Region. (ii) Active Region. **(8)**
Given $\beta = 100$, $V_{BE}(\text{Cut}-\text{in}) = 0.5V$, $V_{BE}(\text{Sat}) = 0.8V$, $V_{CE}(\text{Sat}) = 0.2V$.

**Q.9** a. What is buried layer? What purpose does it serve? What is the type of doping of the buried layer of npn transistor IC? **(8)**

b. Write short note on Integrated Resistors and Integrated Capacitors. **(8)**



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