ROLL NO. _____

Code: AE05 **Subject: BASIC ELECTRONICS**

AMIETE – ET (OLD SCHEME)

Time: 3 Hours **DECEMBER 2011** **Max. Marks: 100**

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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 45 Minutes 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. For a JFET, the value of V_{DS} at which I_D becomes essentially constant is the

(A) pinch-off voltage **(B)** cut-off voltage
(C) breakdown voltage **(D)** ohmic voltage

b. Which amplifier is commonly used as a frequency multiplier?

(A) Class A **(B)** Class B
(C) Class C **(D)** Class AB

c. The monostable multivibrator circuit is not an oscillator because _____

(A) Its output switches between two states.
(B) It requires a trigger to obtain an output signal.
(C) It requires a sine wave input signal.
(D) The circuit does not require a dc power supply.

d. How is a *J-K* flip-flop set?

(A) J='0', K='0' **(B)** J='0', K='1'
(C) J='1', K='0' **(D)** J='1', K='1'

e. Initially, the closed-loop gain (A_{cl}) of a Wien-bridge oscillator should be

(A) $A_{cl} < 3$ **(B)** $A_{cl} > 3$
(C) 0 **(D)** $A_{cl} = 1$

f. At room temperature 25˚C, the barrier potential for Si is 0.7 V. Its value at 125˚C is

(A) 4.5 **(B)** 0.3
(C) 0.9 **(D)** 0.7

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g. Which of the following factors will not decrease as a result of negative feedback?

(A) Bandwidth **(B)** Instability
(C) Gain **(D)** Distortion

h. The ideal value of common mode rejection ratio in an op amp is

(A) 0 **(B)** 1
(C) ∞ **(D)** $-\infty$

i. If V_m is the peak ac voltage of secondary of the transformer in a bridge rectifier, then PIV rating per diode

(A) $\sqrt{2}V_m$ **(B)** V_m
(C) $2V_m$ **(D)** $V_m/\sqrt{2}$

j. Which one of the following specifications is not correct for a common collector amplifier?

(A) High input impedance **(B)** Low output impedance
(C) High voltage gain **(D)** High current gain

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

Q.2 a. For the circuit shown in Fig1, determine V_L, I_L, I_Z and I_R with R_L = 200 Ω and R_L = 50Ω. Comment on the operation of the circuit. Its given that V_{in}=20 V, R_S = 220Ω, V_Z=10 V, $P_{Z(max)}$=400 mW. **(8)**

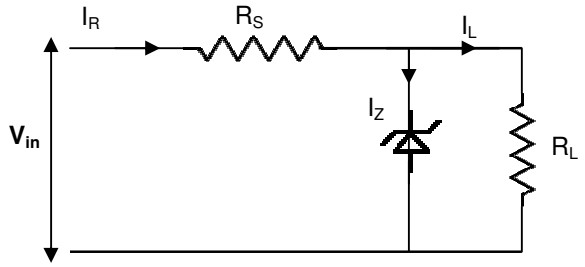

Fig 1

b. With the help of a circuit diagram explain the working of an emitter follower. Also find the expression for its current gain and voltage gain. **(8)**

Q.3 a. Draw the low frequency small signal model of a FET and explain the significance of each element. **(8)**

b. For a small signal BJT amplifier shown in Fig 2 Determine at 1 kHz the following:
(i) quiescent collector current I_{CQ}
(ii) small signal voltage gain (V_o/V_i)
(iii) maximum possible swing of the collector current **(8)**

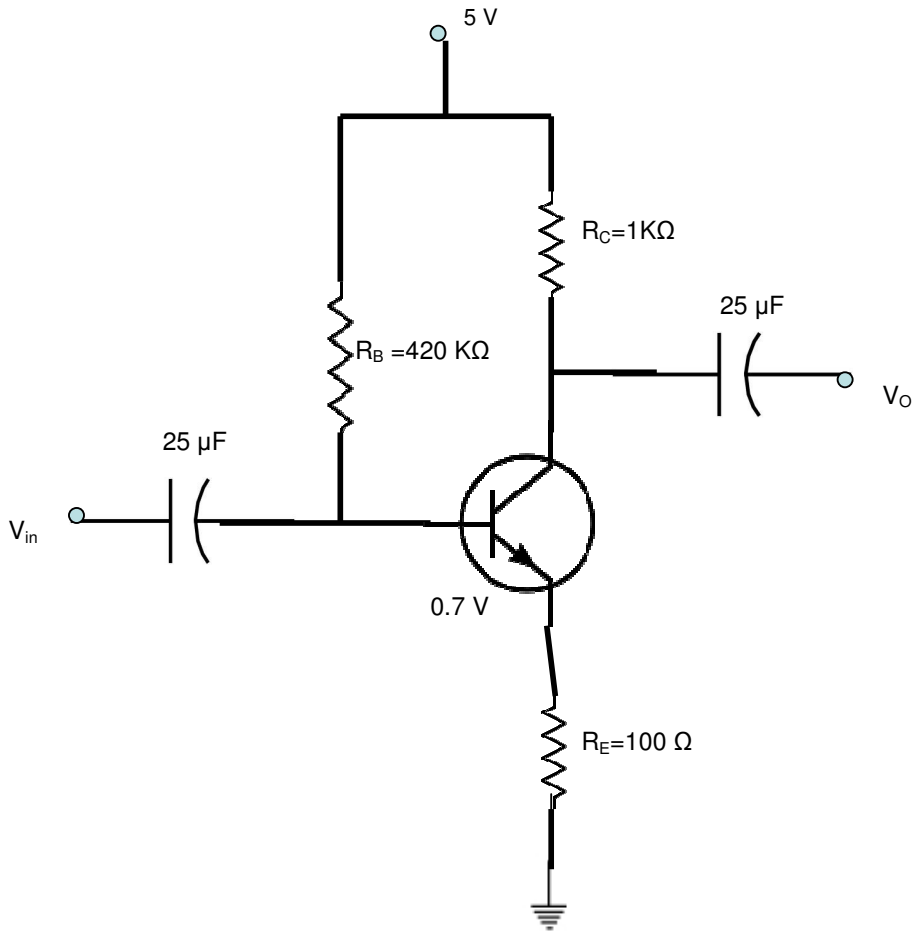

Fig 2

Q.4 a. What is the difference between a voltage amplifier and power amplifier? Derive the conversion efficiency of a Class B Power amplifier and clearly explain the reasons. **(8)**

b. With the help of circuit diagram, explain the working principle of simple capacitor filter for a half wave rectifier and determine the dc output voltage as well as the ripple factor of the half wave rectifier with capacitor filter. **(8)**

Q.5 a Distinguish between voltage feedback and current feedback in an amplifier circuit. State the merits of each and for each case derive the expression for the net output impedance of the amplifier showing the influence of feedback. **(8)**

b. Derive the expression for overall gain of a voltage series feedback amplifier. An amplifier has the midband gain of 1500 and a bandwidth of 4 MHz. The midband gain reduces to 150 when a negative feedback is applied.Determine the value of feedback factor and the bandwidth. **(8)**

Q.6 a. What is the advantage of using a crystal in an oscillator circuit? Draw its equivalent circuit and show how its impedance varies with frequency. **(8)**

b. Draw the circuit of a RC coupled amplifier Explain its behavior at low, mid and high frequencies by drawing separate equivalent circuit for each frequency region. **(8)**

Q.7 a. Fig.3 below shows an Op-amplifier. Find the output in steady–state condition where
(i) Switch S is open (ii) Switch S is closed **(8)**

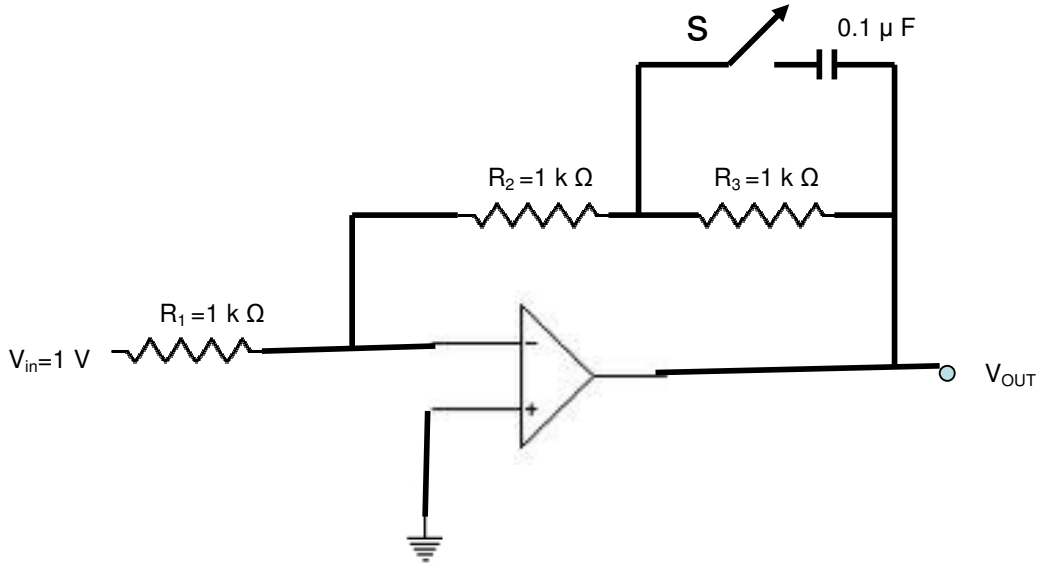

Fig 3

b. Draw the schematic diagram of an operational amplifier configured as an integrator. Also derive the expression for its O/P voltage. **(8)**

Q.8 a. With the help of basic circuit diagram discuss the working of a Schmitt trigger circuit, Also show how is it considered as conventional bistable multivibrator. **(8)**

b. Explain IC 555 as a monostable multivibrator with circuit diagram and find out mathematical expression for pulse width Tp. **(8)**

Q.9 a. Minimize the function given below using K-Maps.
$F(A,B,C,D) = \Sigma m(0,2,3,6,8,9,12,14) + \Sigma d(1,4,10,11)$ **(8)**

b. Design a J-K flip-flop using NAND gates. Explain its working for all the possible values of its inputs. Shows that it behave as a toggle switch when its both input become 1. **(8)**