(vi) A circuit that removes positive or negative parts of waveform is called
(a) clamper (b) clipper (c) diode clamp (d) limiter.

(vii) The bypass capacitor is necessary in self bias configuration as
(a) it blocks dc current originating from the source
(b) it helps in coupling with a next level device
(c) it opposes the gain to fall due to involvement of emitter resistance
(d) all of the above.

(viii) The voltage divider biasing circuit is used in amplifiers quite often because it
(a) limits the ac signal going to base
(b) reduces the cost of the circuit
(c) reduces the dc base current
(d) makes the operating point almost independent of β.

(ix) Maximum efficiency that can be achieved under Class A category is
(a) 25% (b) 78.5% (c) 50% (d) 30%.

(x) The circuit shown in the fig. 2 is a

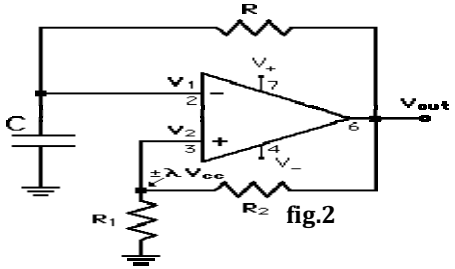

fig.2

(a) square wave generator (b) astable multivibrator
(c) both of them (d) none of them.

Group – B

2. (a) What is a load line? Explain the concept of Q - point.

(b) For CE configuration prove that
$I_C = \beta I_B + (1+\beta) I_{CO}$.

7. (a) Design and explain the operation of a full wave precision rectifier ci

(b) Explain with neat circuit diagram how an op amp is used to antilogarithm of a signal, preventing variation due to temperature.

(c) Draw the circuit diagram of instrumentation amplifier.

5 + 4 + 3

Group – E

8. (a) Classify the power amplifiers with respect to the biasing point. Co the RC coupled and transformer coupled class A amplifiers with r to their maximum efficiency.

(b) Calculate the input power, output power, and efficiency of the am circuit in Fig.6 for an input voltage that results in a base current of peak.

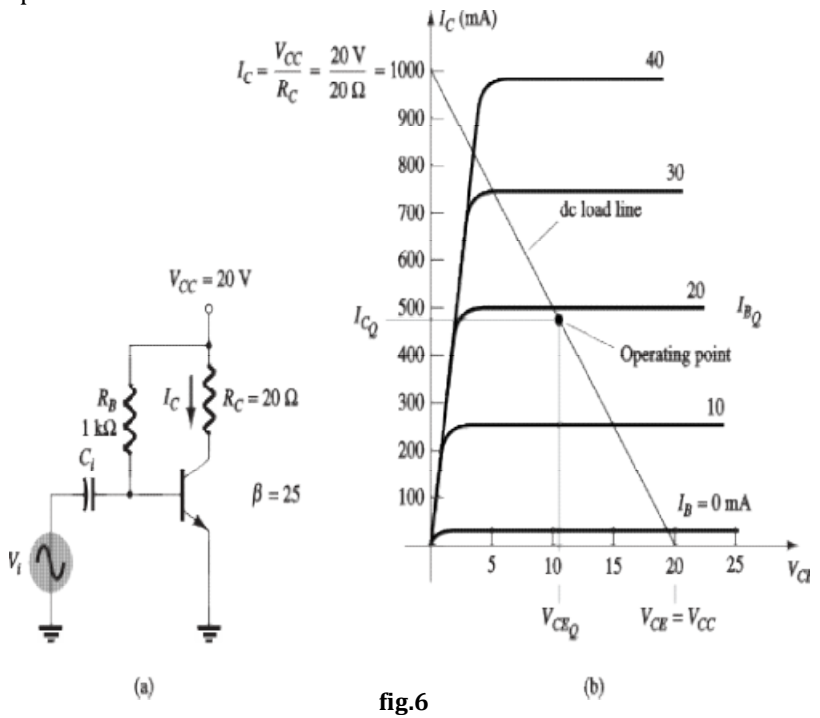

fig.6

6 + 6

9. (a) Draw the circuit diagram and explain the operation of a Monostable Multivibrator using a 555 timer IC. Derive the expression of output pulse width.

(b) In the Astable Multivibrator of the circuit shown in the Fig. 7, R_1 = 6.8kΩ, R_2=3.3kΩ, C=0.1μF and C_1=0.01μF. Determine the positive pulse width T_1, negative pulse width T2, free-running frequency f0, and percentage of duty cycle.

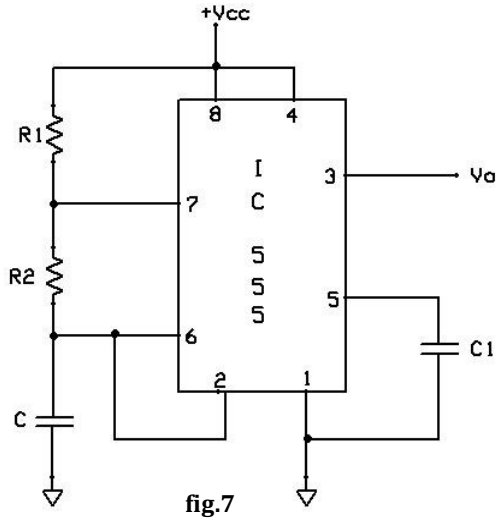

fig.7

6 + 6 = 12

B.TECH/ECE/3RD SEM/ ECEN 2101/2017
ANALOG ELECTRONIC CIRCUITS
(ECEN 2101)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) For a voltage-series feedback system, the input/output impedance get
(a) decreased/decreased (b) increased/decreased
(c) decreased/increased (d) increased/increased.

(ii) If the input to the circuit of fig. 1 is a sine wave the output will be

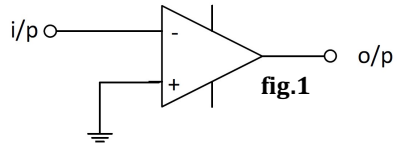

fig.1

(a) a half wave rectified sine wave (b) a full-wave rectified sine wave
(c) a triangular wave (d) a square wave.

(iii) An integrator circuit is basically a
(a) low-pass filter (b) high-pass filter
(c) band-pass filter (d) none of the above.

(iv) A Schmitt trigger uses
(a) positive feedback (b) negative feedback
(c) compensating capacitors (d) pull up resistors.

(v) In a bipolar junction transistor the base region is made very thin so that
(a) recombination in base region is minimum
(b) electric field gradient in base is high
(c) base can be easily fabricated
(d) base can be easily biased.

(c) In a collector to base bias circuit indicated in Fig. 3, a transistor with β = 50 is used. Supply voltage V_{CC} = 10V, V_{BE} = 0.7V, collector resistor R_C = 2kΩ. The bias is obtained by connecting 100 kΩ resistor from collector to base. Find the Q-point and stability factor.

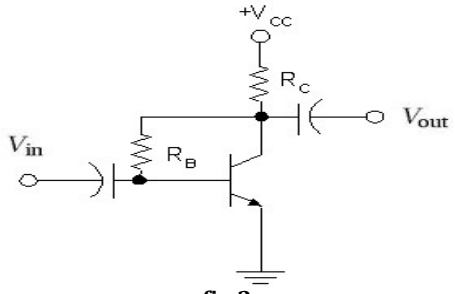

fig.3

4 + 3 + (2 + 3) = 12

3.(a) Using the small signal, low frequency model of BJT as shown in fig. 4, derive expressions of input impedance Z_i, output impedance Z_0, voltage gain A_v and current gain A_i.

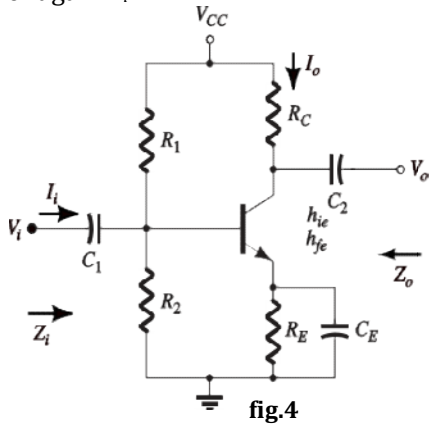

fig.4

(b) For the circuit shown in fig.5, determine the following parameters using hybrid equivalent model:

(i) Input impedance Z_i

(ii) Voltage gain A_v

(iii) Current gain A_i

(iv) Output impedance Z_0

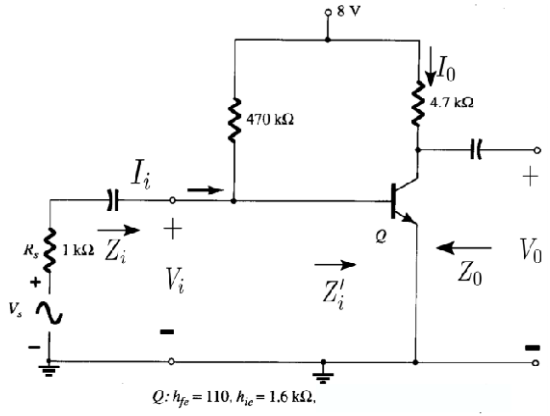

fig.5

6 + 6

Group – C

4. (a) What are the two requirements for a feedback amplifier to pr steady state oscillations? How oscillators are classified?

(b) Sketch the circuit of a phase-shift oscillator and explain its oper Find an expression for the frequency of oscillations and the con for sustained oscillation.

(3 + 2) + 7

5. (a) Draw the equivalent circuit of RC coupled amplifier using hyb model of BJT.

(b) What is Miller capacitance? Explain gain bandwidth product coupled amplifier.

(c) Draw the Hartley's oscillator circuit and calculate the frequency oscillation.

4 + (1 + 2) + 5

Group – D

6. (a) Draw the current mirror circuit and explain its operation.

(b) Mention different types of differential amplifier. Draw the circuit o input balanced output differential amplifier.

(c) Design the equation with suitable block diagram in which output vo $V_{out} = (V_1^{1/3}+V_2^{5/2})^{1/3}$, where, V_1 and V_2 are the input voltages.

3 + 5 + 4