	Utech
Name:	
Roll No.:	In Planta (V Rampings 2nd Explored
Invigilator's Signature :	

ANALOG ELECTRONIC CIRCUITS

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

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

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following:

 $10 \times 1 = 10$

- i) Damping factor of second order Butterworth filter is
 - a) 1.73

b) 1.414

c) 1.06

- d) 0.5.
- ii) The input offset voltage in an Op-Amp is due to
 - a) mismatch in transistor parameters
 - b) voltage irregularity
 - c) imperfect ground
 - d) none of these.

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If gain is A and feedback factor is β , then condition to iii) sustain oscillation of Wein-bridge oscillator is

a)
$$A = 1/3$$
, $\beta = 3$

b)
$$A = 3$$
, $\beta = 1/3$

c)
$$A = 6$$
, $\beta = 1/6$

d)
$$A = 1/6, \beta = 6.$$

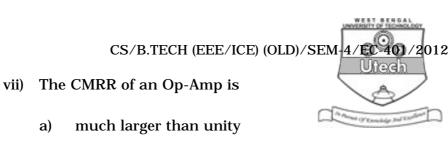
- The current in FET is iv)
 - a) only due to minority carriers
 - only due to majority carriers b)
 - due to both c)
 - none of these. d)
- v) Commercially available Op-Amp is
 - IC 742 a)

b) IC 723

IC 741 c)

- d) IC 555.
- The temperature coefficient of the Zener breakdown vi) voltage is
 - positive a)
- negative b)

c) zero d) none of these.



- a)
- b) zero
- much smaller than unity c)
- unity. d)
- viii) A BJT can act as a switch, when it changes from
 - cut-off to active region a)
 - b) active to saturation
 - c) forward active mode to reverse active mode
 - d) saturation to cut-off region.
- For an enhancement mode *n*-MOSFET, the threshold ix) voltage is
 - positive a)
- negative b)

c) zero

- d) none of these.
- Maximum efficiency of class B push-pull power x) amplifier is
 - 25% a)

b) **65**%

78.5% c)

d) 95%.



(Short Answer Type Questions)

Answer any three of the following.



- 2. Draw a circuit of a class B push-pull power amplifier. Derive its maximum power efficiency and collector dissipation. 2 + 3
- 3. a) Obtain the expression for output voltage of an integrator using Op-Amp.
 - b) Draw the output waveforms if input of a differentiator is
 - i) Triangular wave
 - ii) Sine wave.

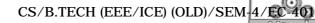
2 + 3

4. Show that depletion width (W) of a p-n junction diode is related to applied potential V in the following way:

 $W \propto K \sqrt{V_0 - V}$ where, K is a constant and V_0 is the contact potential.

- 5. What are the differences between series and shunt regulators? Draw a circuit of a shunt regulator and explain its operation. 2+3
- 6. What do you mean by clamping cicuit? Draw its circuit diagram and discuss its operation.

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GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following.

 $3 \times 15 = 45$

- 7. a) Sketch the basic structure of an *n*-channel enhancement type MOSFET and explain the various parts of it.
 - b) How does the name enhancement and depletion type MOSFET comes into picture?
 - c) Show the circuit symbol for both enhancement and depletion type *n*-channel MOSFET.
 - d) Draw the i_D V_{DS} characteristic curve for common source configuration and indicate all the three regions of operation. 4+6+2+3
- a) What are the characteristics of Ideal Op-Amp ?
 Establish the relationship between slew rate and full power bandwidth.
 - b) Design a circuit to implement the function $f = 3x + \log(2x) + \sin 4x$.
 - c) Why hyteresis is desirable in a Schmitt Trigger Circuit?
 - d) Why multipliers are used for opeation of TV picture tube voltage rather than transformers?

$$3 + 4 + 4 + 2 + 2$$

- 9. a) Draw the Eber's Moll model of the *pnp*-transistor and give the equations for the emitter current and collector current.
 - b) Define and describe about LED.

c) Draw the small-signal high-frequency CE model of a transistor. How does g_m vary with $\mid I_C \mid$, $\mid V_{CE} \mid$ and $\mid T \mid$?

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- 10. Write short notes on any *three* of the following : 3×5
 - a) Wien Bridge Oscillator
 - b) Four basic feedback topolgies
 - c) Astable multivibrator
 - d) Spice model of MOSFET
 - e) Active Filter.

11. a) What do you mean by feedback in amplifiers?

- b) Derive an expression for the closed-loop gain of the amplifier with feedback.
- c) State the assumptions made in your derivation. 3
- d) Write down the effect of negative feedback in an amplifier in terms of gain, bandwidth, input resistance and output resistance with respect to voltage series configuration.

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