No. of Pages 03 Roll No.....

Semester VI B. Tech (EL/EE/EC/EP)

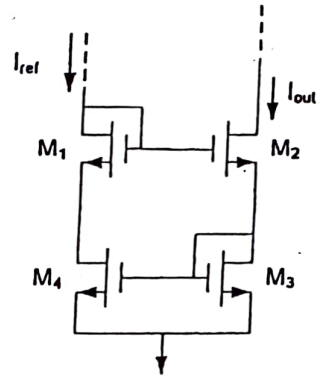
End Semester Examination March-2019

Time: 1:30 Hours Maximum Marks: 20

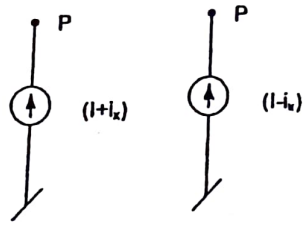
EE- 322 ADVANCED ANALOG CIRCUIT DESIGN

Note: Answer any **SEVEN** questions.
All questions carry equal marks.
Assume suitable value for missing data (if any).

1 Determine the output resistance of the modified Wilson current mirror circuit given below. **03**



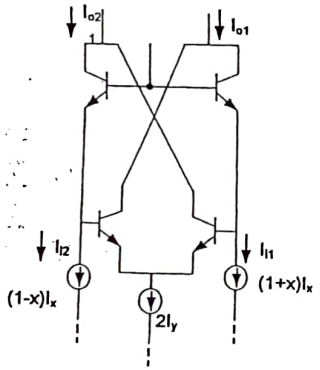
2 With the help of current mirrors realize the following types of current sources where the point P can be at arbitrary potential. **02**



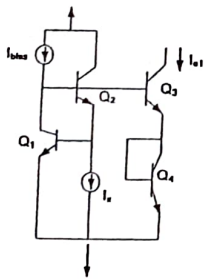
3 Draw the complete circuit of the output stage of the op-amp IC741 (without the short-circuit protection transistors and resistors). Using appropriate analysis determine the bias current (collector) for all the transistors used in the output stage. Take $I_{Ref} = 720\ \mu A$, $\beta_{PNP} = 50$ and $\beta_{NPN} = 200$, $I_{s14} = I_{s20} = 3 \times 10^{-16}$ A. **2.5**

4 Draw the intermediate stage of the op-amp IC741 and carryout a small signal analysis to determine the (i) transconductance of this stage and (ii) input impedance of this stage. Clearly mention any simplifying assumptions made in the analysis. **2.5**

5 Explain the translinear circuit principle as applicable for circuits consisting of BJTs. Using this principle determine the value of $\frac{I_{02}-I_{01}}{I_{i2}-I_{i1}}$, for the circuit shown below. **03**



6 Determine the output current I_{o1} for the circuit shown below: **02**



7 Write short notes on any **TWO** of the following: **2.5 X 2**

(a) Supply current sensing method

(b) Slew rate phenomenon in Operational amplifiers

(c) Cascode current mirror

(d) Instrumentation amplifier design using the supply current sensing method