


Name: Enrolment No:	
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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Electronics
Program: M. Sc (Physics)
Course Code: PHYS 7017

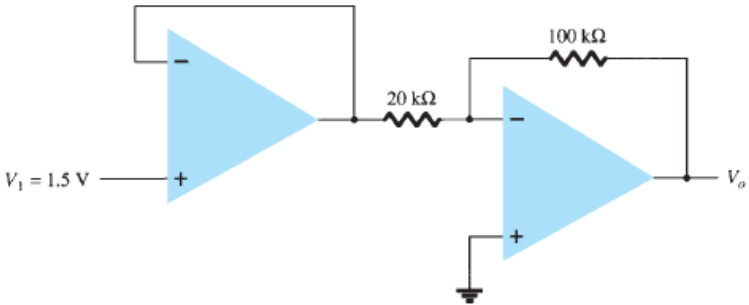
Semester: I
Time: 03 hrs.
Max. Marks: 100

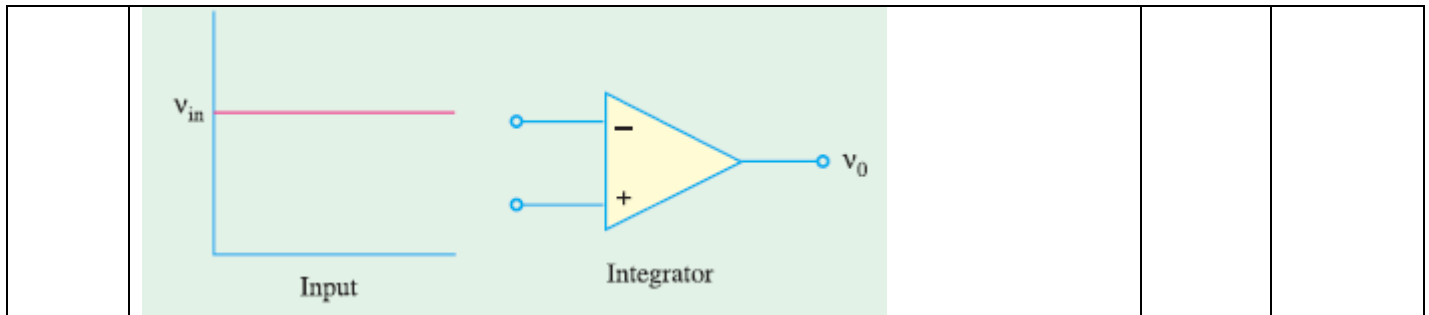
Instructions: The QP is 3 pages long. Draw the neat and clean diagram wherever it is needed.

SECTION A

S. No.	Question	Marks	CO
Q 1	If the emitter current of a transistor is 8 mA and I_B is 1/100 of I_C , determine the levels of I_C and I_B .	4	CO1
Q 2	Define frequency modulation and modulation index. Use a sketch of a sinusoidally modulated FM waveform to help explain the definition.	4	CO4
Q 3	Input and output voltage measurements of $V_i = 10$ mV and $V_o = 25$ V are made. What is the voltage gain in decibels?	4	CO1
Q 4	Design a combinational logic circuit whose output is $F = \bar{A}BC + A\bar{B}C$	4	CO3
Q 5	Sketch the transfer characteristics of an n-channel enhancement-type MOSFET if $V_T = 4$ V and $k = 0.4 \times 10^{-3}$ A/V ² .	4	CO1

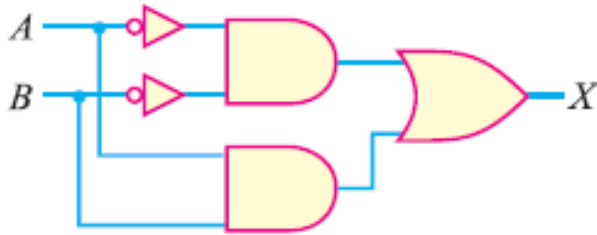
SECTION B

Q 6	<p>(i) Calculate the output voltage of the following circuit</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>(ii) Calculate the CMRR (in dB) for the circuit measurements of $V_d = 1$ mV, $V_o = 120$ mV, $V_{CM} = 1$ mV, and $V_{oCM} = 0.5$ mV.</p>	5+5	CO2
Q 7	<p>Sketch the schematic diagram of an integrator. Prove that the output voltage of integrator is proportional to the integral of input voltage. Draw the output voltage of an integrator circuit if in following input is applied to the inverting terminal of an inverter circuit.</p>	10	CO1



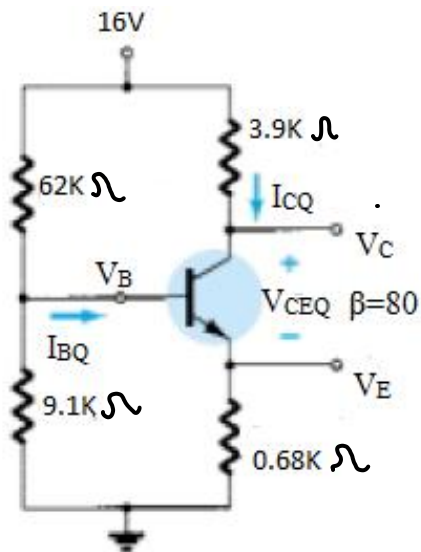
Q 8 Explain the logic operation of master-slave JK flip-flop with neat circuit diagram. Also obtain the truth table for different combinations by analyzing the circuit. **10** **CO3**

Q 9 Derive the output equation from the given circuit and implement the same by using NOR or NAND universal logic gates. **10** **CO3**



SECTION-C

Q 10 (i) Draw the circuit symbol for p-n-p and n-p-n transistors and indicate the reference directions for the three currents and the reference polarities for the three voltages.
 (ii) With the help of neat diagram, explain the transistor as a switch.
 (iii) Determine I_C and V_{CE} for the following network.



5+5+10 **CO1**

Q 11	<p>Sketch the circuit of a phase-shift oscillator using (a) bipolar junction transistor (b) an op-amp. Derive an expression for frequency of oscillation at resonance. Design the phase-shift oscillator for operation at 5kHz.</p> <p style="text-align: center;">OR</p> <p>Sketch the circuit of a Wien bridge oscillator using (a) bipolar junction transistor (b) an op-amp. Derive an expression for frequency of oscillation at resonance. Design the Wien bridge oscillator for operation at 1kHz.</p>	15+5	CO2
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