Question Paper

Exam Date & Time: 08-Jan-2024 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH END SEMESTER MAKEUP EXAMINATIONS, JAN 2024

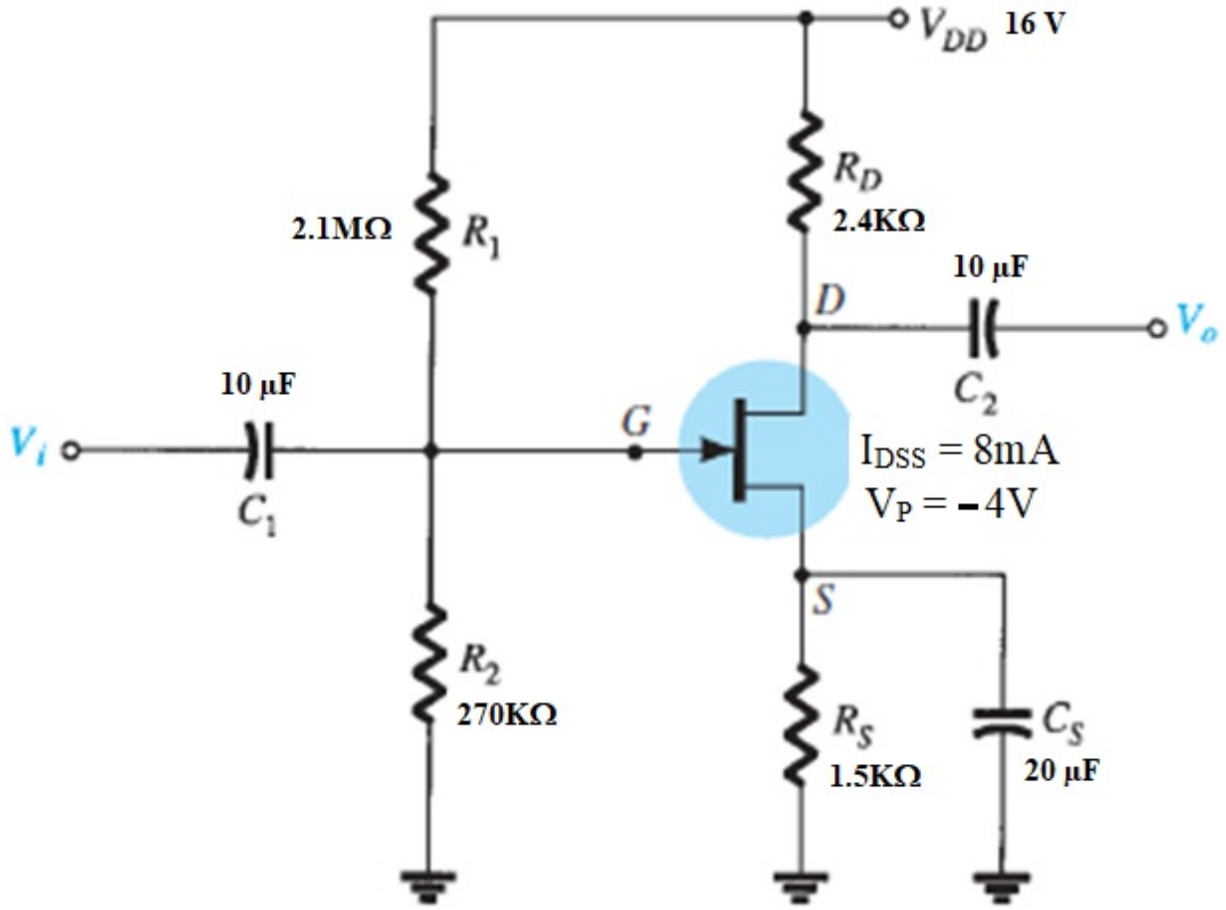
ELECTRONICS CIRCUITS [BME 2122]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Missing data may be suitably assumed
Draw neat circuit diagrams wherever necessary

1) A) For the JFET amplifier circuit shown below, using graphical solution determine (4)
(i) I_{DQ}
(ii) V_{GSQ}, and
(iii) V_{DSQ}



B) A JFET with μ = 55 and r_d = 5.5 KΩ is used in a RC phase shift oscillator. (3)
(i) Find the value of resistor R_D required to produce sustained oscillations.
(ii) What is the value of R required in the frequency selective network to produce sustained oscillations of frequency 3.5 KHz when C = 3.3 pF?

C) Design an Op-amp non-inverting amplifier such that the amplifier develops an output of 0.1V when the input is 1mV. Depict the designed amplifier circuit. (3)

2) Develop an Op-amp based astable multivibrator circuit to produce an output of frequency 1 KHz with 50% duty cycle and amplitude ± 14V. (4)

A)

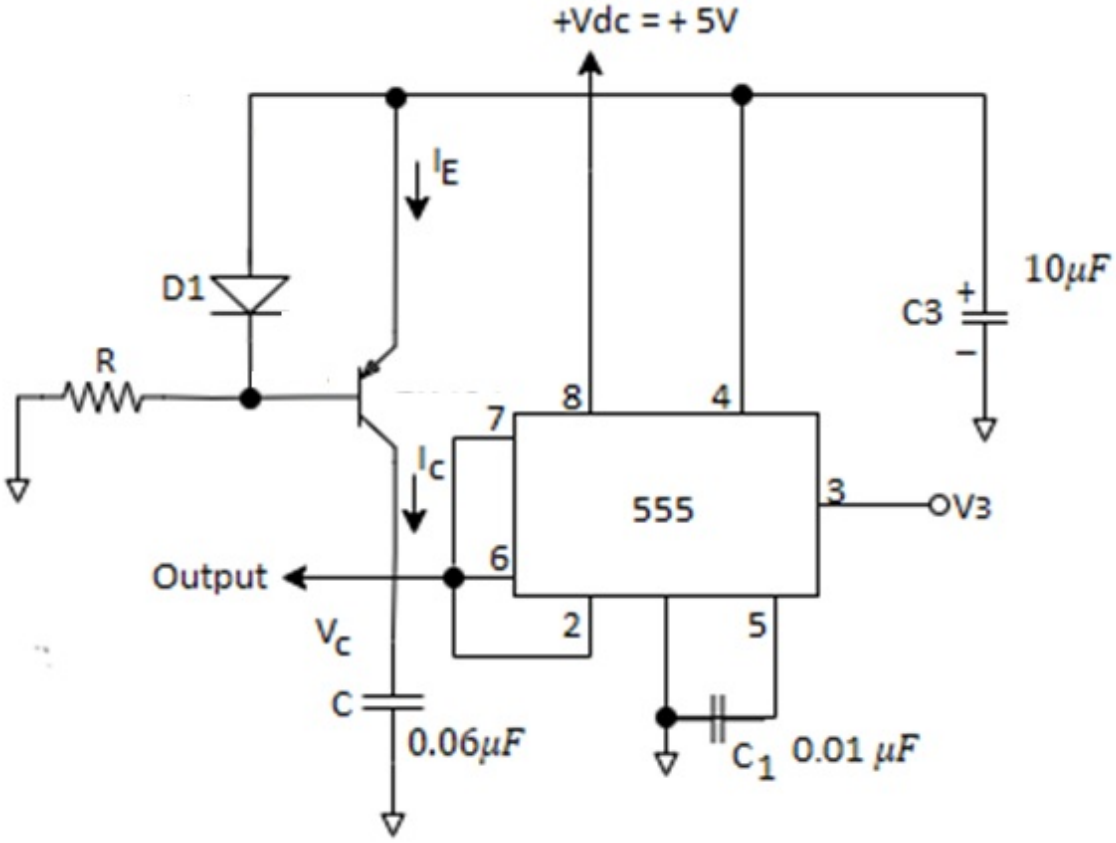
B) How do you make use of an Op-amp as an inverting adder? Explain with an example. (3)

C) Design an inverting Schmitt trigger circuit using an Op-amp such that V_h = 7V and maximum output swing is ± 14V. (3)

3) Build a 3-bit ADC using the following: (4)
(i) Resistive voltage divider network
A) (ii) Op-Amps, and
(iii) Priority encoder

B) What is the resolution and full-scale output of an 8-bit R-2R Ladder digital-to-analog converter, when V_{REF} = 10V and R_F = 2R? (3)

C) In the following circuit, what is the value of R required to generate a free-running ramp of frequency 1 KHz? Assume that the diode and transistors are made up of Silicon. (3)



4) How do you build a constant current source using voltage regulator IC 7805? Explain in detail. (5)

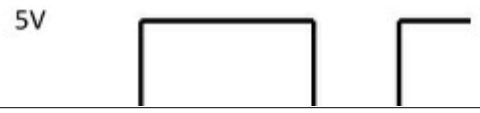
A)

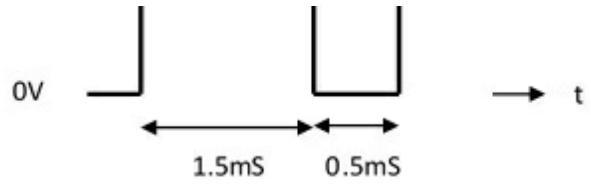
B) How do you make use of a 555 timer as a Schmitt trigger? Explain in detail. (3)

C) Using a 7805 voltage regulator IC, design a 600 mA current source. Assume a quiescent current of 4.0 mA. (2)

5) Design a 555 timer based circuit to generate a periodic waveform as shown below. (4)

A)





B) How do you make use of 555 timer IC to build a negative edge mono-shot circuit? Explain, and derive an expression for the pulse width. (4)

C) If a p-channel JFET has I_{DSS} = 8mA and $V_{GS(off)}$ = 6V, what is the value of Gate-to-source voltage required to produce a drain current of 4 mA and what is the magnitude of pinch-off voltage? (2)

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