Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) (FT/WP) / S1 (PT) Examination November/December 2025 (2019 Scheme)

Course Code: EET205

Course Name: ANALOG ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1	What is the role of coupling capacitor and bypass capacitor in BJT amplifier circuit?	(3)
2	Discuss the input characteristics of BJT	(3)
3	Show how a FET can be used as voltage variable resistor	(3)
4	Define (i) Pinch off voltage and (ii) Gate-Source cut off voltage of JFET	(3)
5	Draw and explain the equivalent circuit of crystal.	(3)
6	What is Barkhausen's criterion? Explain.	(3)
7	With suitable circuit and relevant waveforms, briefly explain the operation of double ended differential input amplifier circuit	(3)
8	Derive the expression for the output voltage of a closed loop non-inverting amplifier using op-amp.	(3)
9	Explain the working of a zero-crossing detector using op-amp.	(3)
10	Explain the operation of a triangular wave generator using op-amp	(3)

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11	a)	A silicon transistor with β=80 is used in self-biasing arrangement with V_{cc}=18V, R_C=4.2kΩ. The operating point Q is at V_{CE}=8V, I_C=1.5mA. Find values of R_1, R_2 and R_E. Also calculate the stability factor S.	(10)
	b)	Discuss the output characteristics of CE BJT circuit	(4)
12	a)	Draw the equivalent circuit and Derive the expression for (i)input impedance (ii) Current Gain (iii) Voltage gain and (iv) Output admittance of the CE amplifier	(8)
	b)	Derive the expression for the stability factor for the voltage divider bias circuit.	(6)

Module 2

13 a) With the help of neat diagrams, explain the operation, and characteristics of Enhancement type metal oxide semiconductor. (8)

b) Define (i) AC drain resistance (ii) Transconductance and (iii) amplification factor of JFET. (6)

14 a) With suitable diagram, derive the equation for lower cut-off frequency of CE amplifier and prove that the gain is down 3dB at low frequency (7)

b) Consider an n-channel enhancement MOSFET connected in voltage divider biasing circuit with following particulars: V_{DD}=20V, R_1= 10MΩ, R_2= 6.8MΩ, R_D= 2.2kΩ, R_S= 0.75kΩ, $I_{D(on)}$= 5mA and $V_{GS(on)}$=6V. The Gate to Source threshold voltage is 3V. Calculate I_D and V_{GS} (7)

Module 3

15 a) With suitable diagram explain the working of class A power amplifier derive its maximum power conversion efficiency. (9)

b) Compare different coupling methods used in multistage amplifiers. (5)

16 a) With necessary diagram explain the working of RC phase shift oscillator using BJT and derive the expression for frequency of oscillation. (10)

b) List the advantage and disadvantages of Transformer coupled multistage amplifier (4)

Module 4

17 a) A sine wave of peak voltage 4V is applied to an inverting amplifier with R_1=10 kΩ, R_f=40 kΩ. If the supply voltage given to op-amp is $\pm 12V$. Determine the output voltage and sketch the waveform. (5)

b) Derive the expression for the output voltage of a difference amplifier using op-amp with inputs V_1 and V_2. Also design a difference amplifier to get an output$V_o = 5V_1 - 10V_2$. (9)

18 a) Define a) CMRR b) Slew rate c) Common mode gain and d) Differential mode gain (8)

b) With neat circuit diagram, explain the operation of Instrumentation amplifier. (6)

Module 5

19 a) With neat circuit diagram explain the working of a Schmitt trigger using op-amp. In the circuit of Schmitt trigger $R_1 = 50k\Omega$, $R_2 = 10k\Omega, V_i =$ (9)

$10 \sin \omega t$ and saturation voltage is ± 13. Determine the threshold voltages, draw input, and output waveforms.

b) Draw and explain the operation of a square waveform generator using op-amp (5)

20 a) With the help of internal circuit diagram explain the working of a monostable multivibrator. (6)

b) With neat circuit diagram explain the working of an ideal differentiator. Derive the output voltage equation. What are the disadvantages of ideal differentiator and what are the modifications done in practical integrator to overcome this (8)

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