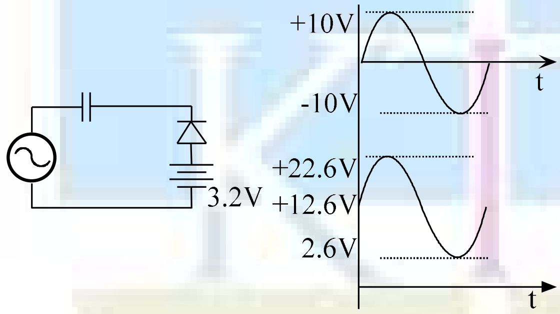
Total Pages:2

Course Code: EE203

Course Name: ANALOG ELECTRONICS CIRCUITS

Max. Marks: 100		Duration: 3 Hours

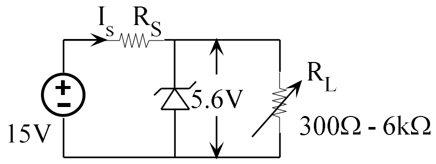
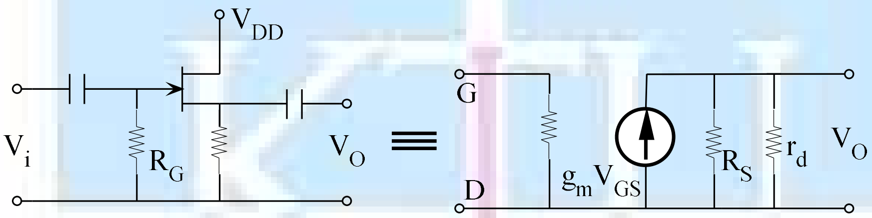
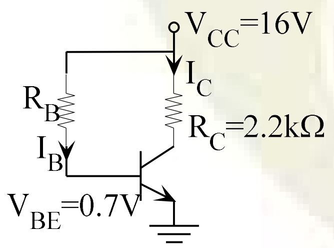
PART A

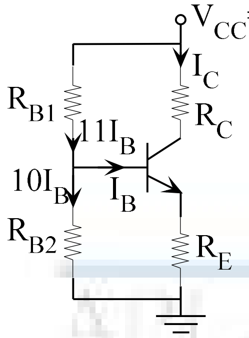
		Answer all questions, each carries 5 marks.	Marks
1		Circuit diagram (2), Design (2), Waveform (1)  Note : Amplitude of input sine wave shall be arbitrary.	(5)
2		Effect of capacitors on lower and higher cut off frequencies (3) Sketch the frequency response of CE amplifier (2).	(5)
3		Negative feedback limits the amplifier operation in linear range (2) Expression of Gain, Input and Output Impedance with negative feedback (3)	(5)
4		Bandwidth of a non inverting amplifier for a gain of 60dB=10kHz (3) Closed loop gain if the required bandwidth is 100kHz=40dB (2)	(5)
5		Circuit diagram of an ideal differentiator with corresponding input and output waveform (4) Gain increases with frequency and no limit for maximum input frequency in ideal case (1)	(5)
6		Design (3) Waveforms (2)	(5)
7		Circuit (3), Design (2)	(5)
8		Circuit (3), Design (2)	(5)

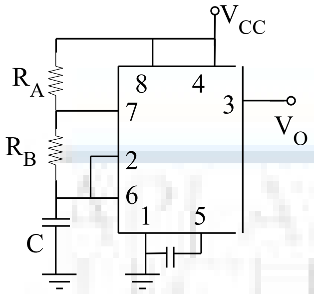
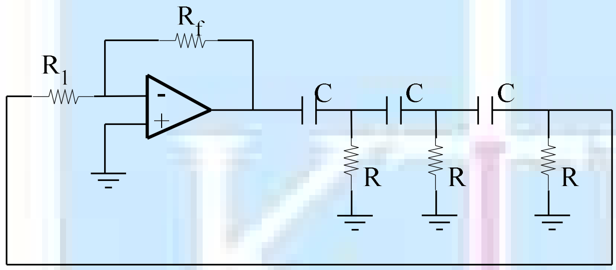
PART B

Answer any twofull questions, each carries10 marks.

9	a)	Construction (3), Operation (2)	(5)

	b)	 $I_{Z\min} = 0.25mA \quad I_{Z\max} = \frac{P_z}{V_z} = \frac{288mW}{5.6V} = 50mA$ $I_{L\min} = \frac{5.6V}{6k\Omega} = 0.93mA \quad I_{L\max} = \frac{5.6V}{300\Omega} = 18.67mA$ $I_{S\max} = I_{Z\max} + I_{L\min} = 50.93mA \quad I_{S\min} = I_{Z\min} + I_{L\max} = 18.92mA$ $R_{S\min} = \frac{15-5.6}{50.93} = 184.56\Omega \quad R_{S\max} = \frac{15-5.6}{18.92} = 496.8\Omega$ 184.56Ω<Rs<496.8Ω and say Rs=300Ω Design ...... (4) Power rating=0.29W , Use half watt resistor .... (1)	(5)
10	a)	(i) At $I_D = 3.5mA \quad I_D = I_{DSS}(1-\frac{V_{GS}}{V_P})^2 \quad V_{GS} = -1.97V$ ..... (3) (ii) $g_m = \frac{I_D}{V_{GS}} = 1.78mA/V$ ..... (2)	(5)
	b)	 AC equivalent circuit ..... (2) $A_V = \frac{g_m(R_S//r_d)}{1+g_m(R_S//r_d)}$ ..... (1) $Z_{in} = R_G$ ..... (1) $Z_o = R_S//r_d//{}^{1}/_{g_m}$ ..... (1)	(5)
11	a)	 β=100V R_B=240kΩ $V_{CC} = I_B R_B + V_{BE} \quad I_B = 63.75mA$ .... (2) $I_C = \beta I_B = 6.375mA$ .... (1) $V_{CE} = V_{CC} - I_C R_C = 1.975V$ .... (2)	(4)

	b)	 β=100V V_{BE}=0.7V $V_{RC} = 40\%V_{CC} = 8.8V \quad V_{CE} = 50\%V_{CC} = 11V \quad V_{RE} = 10\%V_{CC} = 2.2V$ $I_C = 0.8mA \quad I_B = \frac{I_C}{\beta} = 8\mu A$ $10I_B R_{B2} - V_{BE} - V_{RE} = 0 \quad R_{B2} = 36.25k\Omega$ $V_{RB1} = V_{CC} - V_{RB2} = 19.1V \quad R_{B1} = \frac{19.1}{11\times 8\times 10^{-6}} = 217.05k\Omega$ $R_C = \frac{V_{RC}}{I_C} = 11k\Omega \quad R_E = \frac{V_{RE}}{I_E} = 2.75k\Omega$ Design of bias circuit ...... (4) Stability factor S ...... (2) $S = \frac{1+\beta}{1+\beta\frac{R_E}{R_E+R_{TH}}} = 11.07 \quad R_{TH} = \frac{R_{B1}\times R_{B2}}{R_{B1}+R_{B2}} = 31.1k\Omega$	(6)
PART C			
Answer any twofull questions, each carries10 marks.			
12	a)	Name different schemes of coupling (1). Compare their merits and demerits (4)	(5)
	b)	Reasons including cross over distortion (5)	(5)
13	a)	Circuit (1) Derive the expression (4)	(5)
	b)	$CMRR = 20\log\frac{A_d}{A_c} = 20\log\frac{175000}{0.18} = 119.76$ ..... (3) Time = $\frac{20}{0.5} = 40\mu S$ ..... (2)	(5)
14	a)	Expression for output power (3) Conversion efficiency (2)	(5)
	b)	Difference with gain expressions (2) the limiting value of output voltage=bias voltage (1) transfer characteristics (2)	(5)
PART D			
Answer any twofull questions, each carries 10 marks.			
15	a)	Circuit (2) Design (3) $V_{out} = -R_f\left[\frac{V_1}{R_1}+\frac{V_2}{R_2}+\frac{V_3}{R_3}\right]$ Find R_1, R_2, R_3 such that $\frac{R_f}{R_1} = 0.3 \quad \frac{R_f}{R_2} = 3 \quad \frac{R_f}{R_3} = 1$	(5)
	b)	Circuit diagram of an Instrumentation amplifier (3),derive expression for output	(5)

		voltage (2)	
16	a)	Circuit of a triangular wave generator (3) working (1) frequency expression (1)	(5)
	b)	Design (3) circuit (2)  Time period T = 0.5 mS T_{ON} = TD = 0.5 x 0.6 = 0.3mS T_{OFF} = 0.2mS $T_{ON} = 0.69 R_B C$ Let C = 0.1μF R_B = 2.9kΩ $T_{ON} = 0.69(R_A + R_B)C$ R_A = 1.4kΩ	(5)
17	a)	Circuit diagram (3) Waveforms (1) Main advantage over a normal rectifier (1)	(5)
	b)	Design (3) circuit diagram (2)  $f = \frac{1}{2\pi RC\sqrt{6}} = \frac{0.065}{RC}$ $RC = \frac{0.065}{1000} = 0.065 \times 10^{-3}$ Take C = 0.1μF R=650Ω $R_f = 29 R_1$ $R_1 \le 10R$ R_1=6.5kΩ R_f=188.5kΩ	(5)
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