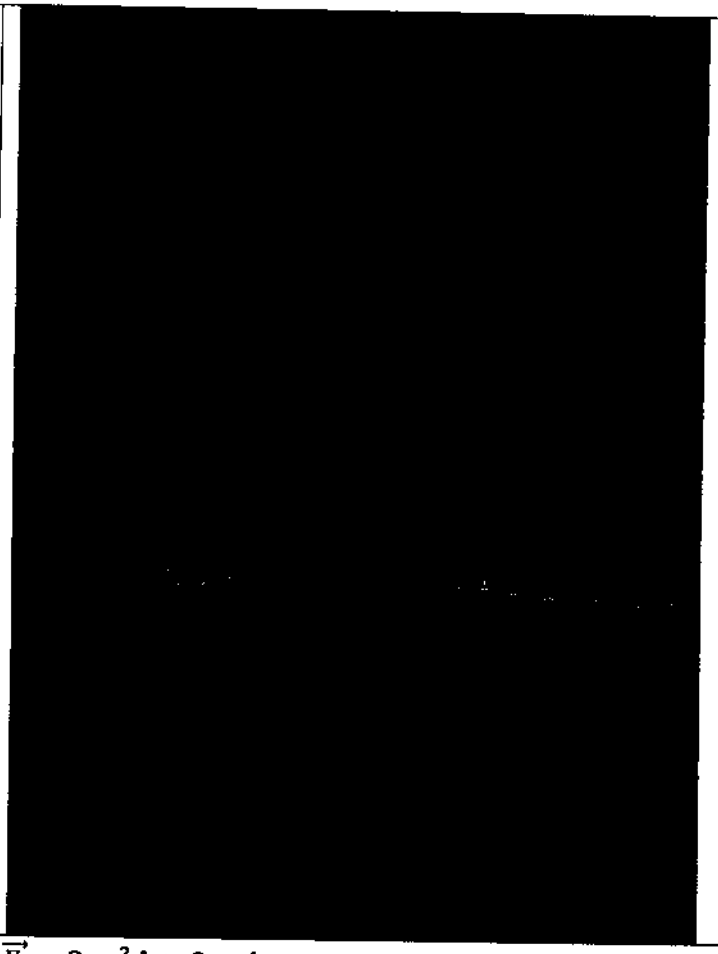
Time: 3Hrs

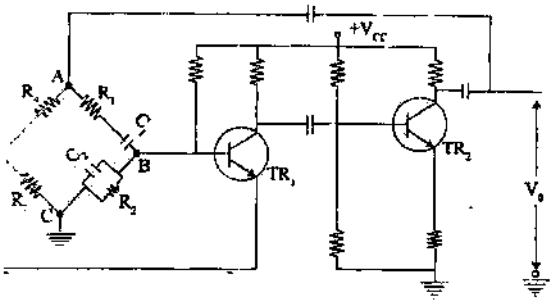
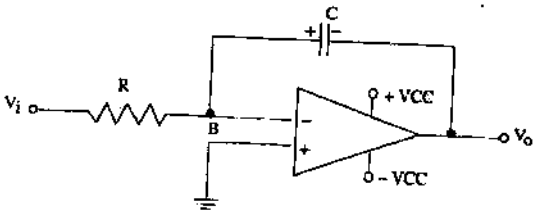
00054369

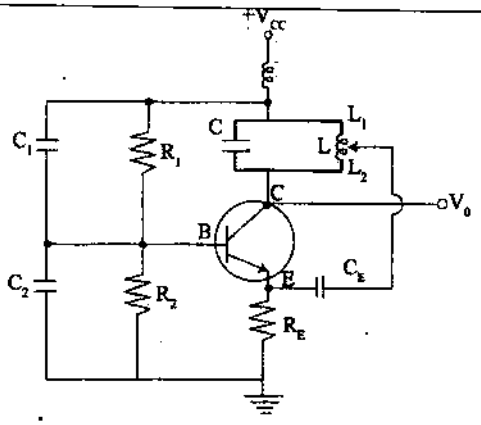
Marks:-100

N.B : (1) All questions are compulsory.
(2) Figures to the right indicate maximum marks.
(3) Use of non-programmable calculators is permitted.
(4) Symbols used have their usual meaning

Q1.	A)	Select correct answer.	(12)
	1	**b) conservative**	
	2	**b) $\rho\, d\rho\, d\theta\, dz$**	
	3	**b) unfaithful amplification**	
	4	**b) is reduced**	
	5	**d) 60^0**	
	6	**c) 1**	
	B)	Answer in one sentence.	(03)
	1	$h_1 = 1,\ h_2 = r,\quad h_3 = r\sin\theta$	
	2	The ideal value of stability factor is 1	
	3	Slew rate is the rate of change of close loop output voltage per unit time.	
	C)	Fill in the Blanks.	(5)
	1	**$d\vec{s} = dx\, dy\, \hat{k}$**	
	2	**$\nabla \times \vec{A} = 0$**	
	3	**not fall below 1V**	
	4	**6**	
	5	**decreases.**	
Q2.	A)	Attempt any one.	(8)
	1	Statement & explanation-2 Problem solving- 6	
	2	Problem solving- 8	
	B)	Attempt any one.	(8)
	1		
	2	Spherical co-ordinate system----2 marks Derivations of unit vectors -----6 marks	
	C)	Attempt any one.	(4)

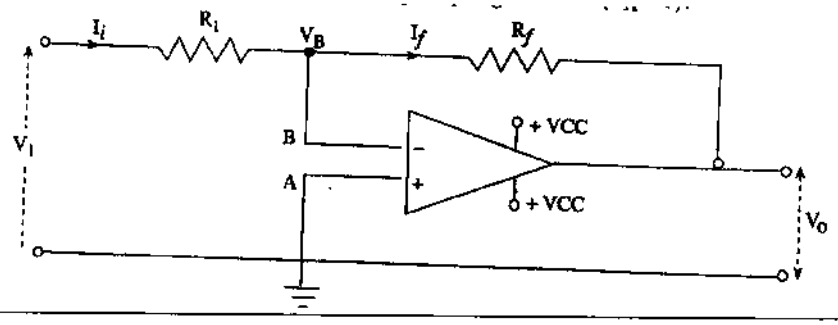
	1		
	2	$\vec{F} = 2xy^2\,\hat{\imath} + 3xy\,\hat{\jmath}$ Path - O(0,0) to P(1,1) described by equation $y = x^2$. W=$\frac{46}{30}$ *units*	
Q3.	A)	Attempt any one.	(8)
	1	Circuit diagram and description (3 Marks) Circuit Analysis (Deriving I_C and V_{CE}) (3 Marks) Discussion of circuit stabilisation (2 marks)	
	2	Stability factor (2 marks) Input resistance (2 marks) output resistance (2 marks) Bandwidth (2 marks)	
	B)	Attempt any one	(8)
	1	Circuit diagram and description (3 Marks) Circuit Analysis (Deriving I_C and V_{CE}) (3 Marks) Discussion of circuit stabilisation (2 marks)	
	2	Circuit diagram (2 marks) Identifying different sections (4 marks) Phase inversion in CE amplifier (2 marks)	
	C)	Attempt any one	(4)

	1	**For a silicon transistor,** $V_{BE} = 0.7$ V $I_B = \frac{I_C}{\beta} = 1/100 = 0.01$ mA (1 mark) Now $V_{CE} = V_{BE} + V_{CB}$ or $2 = 0.7 + V_{CB}$ $\therefore$ $V_{CB} = 2 - 0.7 = 1.3$ V (2 marks) $\therefore$ $R_B = \frac{V_{CB}}{I_B} = \frac{1.3\text{V}}{0.01\text{ mA}} = 130\text{ k}\Omega$ (1 mark)	
	2	Bandwidth diagram (1 marks) Explanation (3 marks)	
Q4.	A)	Attempt any oneUNIT III	(8)
	1	Diagram (03)+working(04)+frequency(01)  $f = \frac{1}{2\pi\sqrt{R_1R_2C_1C_2}}$	
	2	Definition(01)+diagram (02)working(02)+derivation(03) The op-amp circuit where output voltage is proportional to the integral of the input.  $Vo = \frac{-1}{RC}\int Vi\,dt$	
	B)	Attempt any one.	(8)
	1	Definition(01)+diagram(03)+working(04) The electronic circuit that generates periodic waveforms / alternating signals at the output terminal with only dc supply as input.	

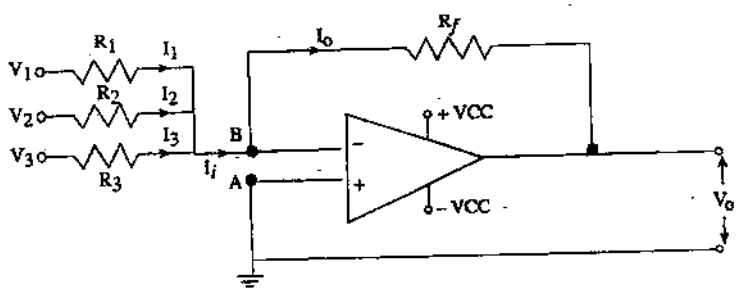


$f = \frac{1}{2\pi\sqrt{LC}}$ or $\frac{1}{2\pi\sqrt{(L_T)C}}$ $\quad L_T = L_1 + L_2 + 2M$

	2	Definition(02)+diagram(02)+derivation(04)	



	C)	Attempt any one.	(4)
	1	Diagram(02)+working(02)	



$R_1 = R_2 = R_3 = R$ and $R_F = R/3$

	2	Ri = 10KΩ , R_F = 22KΩ Gain = $\frac{-R_F}{Ri}$ = -2.2 ----------2 marks For Vi = 150mV , Vo = 0.33V ----------1 mark For Vi = - 3V , Vo = 6.6V ----------1 mark	
Q5.		Attempt any Four.	(20)
	1	Divergence theorem statement (2 marks) Explanation with examples of positive, negative divergence (3 marks)	

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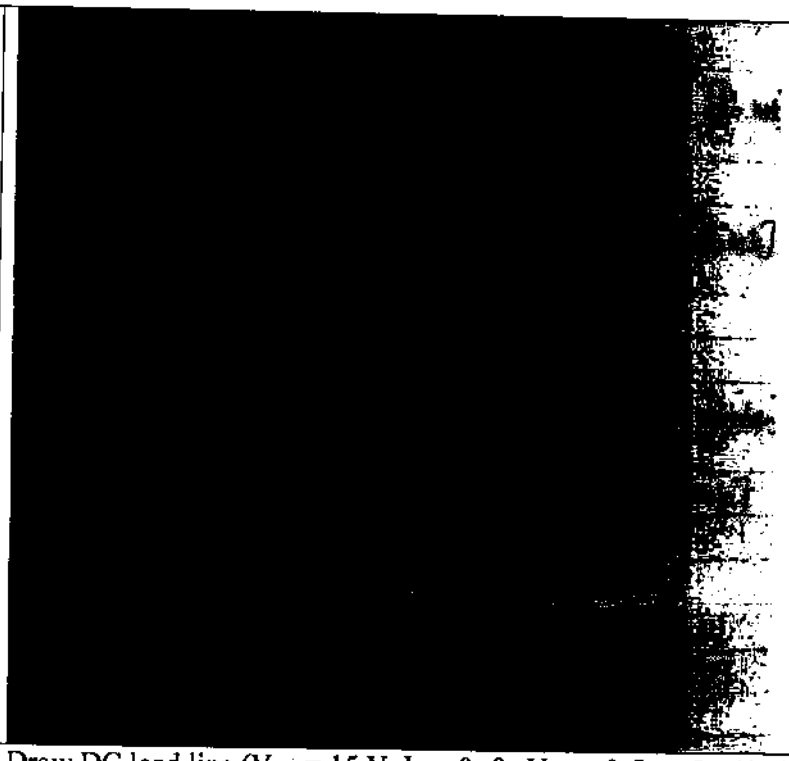
	2		
	3	Draw DC load line (V_{CE} = 15 V, I_C = 0 & V_{CE} = 0, I_C = 5mA) (3 marks) Operating point V_{CE} = 8.55 V, I_C = 2.15 mA (2 marks)	
	4	(i) the voltage gain with feedback = 8 (1 mark) (ii) the input resistance with feedback = 5 KΩ (2 mark) (iii) the output resistance with feedback = 10 KΩ (2 mark)	
	5	For a typical transistorized Colpitt's oscillator C_1 = 0.05μF, C_2= 0.5μF and L = 200 mH. $\beta = \frac{C1}{C2} = 0.1$ ----------1 mark Av = 1/β = 10 ----------1 mark $CT = \frac{C1C2}{C1+C2}$ =0.045μF ----------1 mark $F = \frac{1}{2\pi\sqrt{L.CT}}$ =1678Hz ----------2 marks	
	6	V_1 = 2V, V_2 = 2.5V and V_3 =3.2V R_1 =2KΩ , R_2 = 1.5KΩ , R_3 = 1.8KΩ and R_F = 2KΩ $V_o = -Rf\left[\frac{V_1}{R_1} + \frac{V_2}{R_2} + \frac{V_3}{R_3}\right]$ ----------1 marks Vo = -8.89V ----------2 marks If V_0 = -10V, R_F = 2025KΩ ----------2 marks	