

FOURTH SEMESTER

B.E. (COE/EC/EE)

MID SEM EXAMINATION

March 2007

COE/EC/EE-211 ELECTRONICS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] For the circuit shown in Fig.1 the transistor parameters are $\beta_0 = 100$, $V_A = 160$ V. Calculate the open circuit voltage gain. What will be the voltage gain if input resistance of the subsequent stage is $1\text{ M}\Omega$. 3

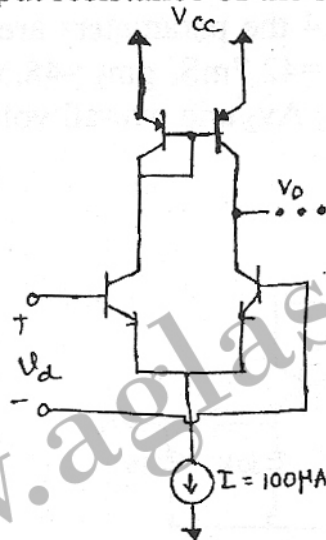


Fig-1

- [b] For the circuit shown in Fig.-2 the transistor parameters are : $\beta_0 = 100$, $V_{BE} = 0.7$ V and $V_A = \infty$

- Determine R_E such that $I_E = 150\text{ }\mu\text{A}$.
- Find A_{DM} (single ended), A_{CM} and CMRR.

5

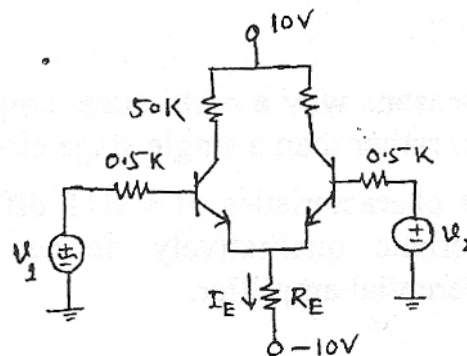


Fig-2

- 2[a] The circuit shown in Fig.3 is an IC MOS amplifier formed by cascading two common source stages. Assuming the biasing current sources have very high output resistance find an expression for overall voltage gain in terms of g_m and r_o of Q_1 and Q_2 . 2

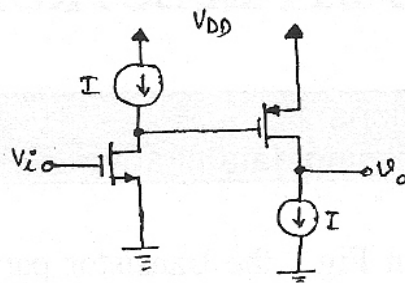


Fig-3

- [b] For the circuit shown in Fig.4 the parameters are $\beta_0 = 100$ and $V_A = \infty$ for both Q_1 and Q_2 and $g_{m1} = 42.7 \text{ mS}$, $g_{m2} = 48.5 \text{ mS}$. Determine the small signal voltage gain A_{v1} , A_{v2} and overall voltage gain. 4

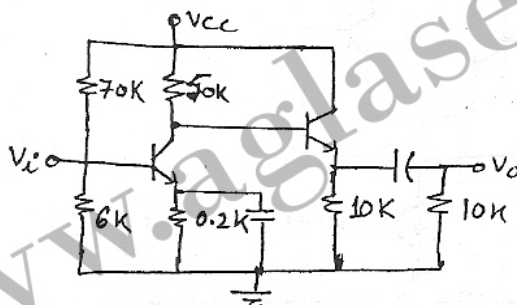


Fig-4

- 3 For the given transfer function sketch the Bode magnitude plot.

$$G(S) = \frac{10S}{(S + 20)(S + 2000)}$$

2

- 4[a] State at least two reasons why a multi stage amplifier circuit would be required in a design rather than a single stage circuit. 2
- [b] Sketch the transfer characteristics of a BJT differential amplifier and from the characteristic qualitatively define the linear region of operation for a differential amplifier. 2

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FOURTH SEMESTER

B.E. (EE/EC/COE)

MID SEM EXAMINATION

March 2007

EE/EC/COE-212 ELECTROMAGNETICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.

Assume suitable missing data, if any.

- 1 State Divergence theorem. Find both sides of the divergence theorem if

$$\vec{A}(r, \theta, \phi) = 2r^2 \vec{a}_r$$

for the volume enclosed between $r = 1$ and $r = 3$. Is the theorem satisfied? 4

- 2 Transform the following vector from spherical to Cartesian coordinates

$$\vec{A}(r, \theta, \phi) = \frac{1}{r} \vec{a}_r$$

Find its value at $(1, -2, 1)$ 4

- 3 Derive the expression for energy stored in an Electrostatic field. 4

- 4 A point charge $-Q$ is placed at a height 'h' above an infinite conducting sheet. Using theory of images, find surface charge induced on the conducting sheet. 4

- 5 A common boundary separates two different media as shown.

Find \vec{E}_2

$$\bar{E}_1 = E_0(4\bar{a}_x - 5\bar{a}_y - 6\bar{a}_z)$$

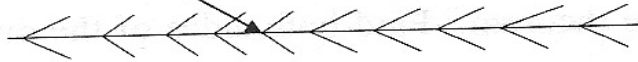
Medium 1

$$\mu_1 = \mu_0 ; \sigma_1 = 0$$

$$\epsilon_1 = 5 \epsilon_0$$

$$z > 0$$

$$\rho_s = 6\epsilon_0 E_0$$



$$E_2 = ?$$

Medium 2

$$\mu_2 = \mu_0 ; \sigma_2 = 0$$

$$\epsilon_2 = 2 \epsilon_0$$

$$z < 0$$

FOURTH SEMESTER

B.E. (EE)

MID SEM EXAMINATION

March

2007

EE-213 MATHEMATICS-IV

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions selecting TWO parts from each questions.

Assume suitable missing data, if any.

1[a] Differentiate between differentiability at a point and analyticity of a complex function. Illustrate with the example.

[b] If $\omega = \phi + i\psi$ represents the complex potential for an electric field and

$$\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$$

determine the function ϕ

[c] If $w = \sin z$ show that the maps of the lines $x = \text{constant}$ and $y = \text{constant}$ form a system of confocal conics in the w -plane.

6

2[a] State and prove Cauchy's theorem. Evaluate $\int_c \frac{dz}{z - z_0}$ where c is any simple closed curve and (i) z_0 is outside c (ii) z_0 is inside c .

[b] Evaluate $\int_c \frac{dz}{\sinh z}$ where c is $|z| = 4$.

[c] Evaluate the integral $\int_c \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ where c is a rectangle

with $(0, -1)$, $(3, 3)$ one of the diagonal vertices.

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3 Evaluate using contour integration

[a] $\int_{-\infty}^{\infty} \frac{dx}{x^4 + 1}$

[b] $\int_0^{2\pi} \frac{d\theta}{a + b \sin \theta} \quad a > |b|$

[c] $\int_0^{\infty} \frac{\sin x}{x} dx$

FOURTH SEMESTER

B.E. (EE)

MID SEM EXAMINATION

March 2007

EE-214 FLUID MECHANICS & HYDRAULIC MACHINES

Time: 1 Hour 30 Minutes

Max. Marks : 20

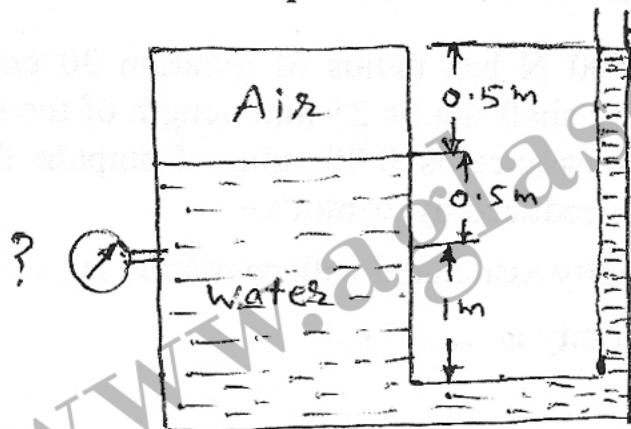
Note : Answer any **TWO** questions.
Assume suitable missing data, if any.

- 1[a] Water rises to a height of 5 cm in certain capillary tube. In the same tube the level of mercury surface is depressed by 1.54 cm. Compare the surface tension of water and mercury (the angle of contact for water is 0° and for mercury 130°). 2
- [b] A fly wheel weighting 500 N has radius of gyration 30 cm and is rotating at 1000 r/min. The shaft dia. is 25 mm, length of the sleeve is 50 mm and the radial clearance is 0.05 mm. Compute the fluid viscosity when its speed is reduced by 2r/min/s. 3
- [c] The most significant property associated with cavitation is 1
- [d] The bulk modulus of elasticity is 1
- [e] What is Pascal's paradox 1½
- [f] Explain the term 'meta-centre and meta centric height 1½
- 2[a] Derive relation for dp and angle of free surface when fluid in a container is subjected to acceleration in x-z plane (vector method). 3
- [b] A submarine moves horizontally in sea and has its axis much below the surface of water. A pitot static tube properly placed just in front of the submarine and along its axis, is connected to two limbs of a U-tube manometer containing mercury. The difference of mercury levels is found to be 17 cm. Find the speed of the submarine knowing that the density of sea water is 1.026 with respect to fresh water. 2

- [c] A venturimeter with a throat of 100 mm is fitted in a vertical pipe line of 200 mm dia. with oil of specific gravity 0.88 flow upwards at a rate of $0.06 \frac{m^3}{s}$. the c_d is 0.96. Two pressure gauges calibrated in kN/m^2 are fitted at tapping points, one at the throat and the other in the inlet pipe 320 mm below the throat. The difference between the two gauge pressure readings is $28 kN/m^2$.

Working from the Bernoulli equation determine (a) the volume flow rate of oil (b) the difference of level in the two limbs of a mercury manometer if it is connected to the tapping points and the connecting pipes are filled with the same oil. 5

- 3[a] Determine the reading on the pressure gauge for the tank in Fig. Calculate also the pressure of the air entrapped. 3



- [b] A hydraulic jack consists of a connected mass of oil with two pistons. The smaller piston $15 cm^2$ in area is to take the force applied whereas the large piston $150 cm^2$ in area carries the load. Assuming that a person can apply a force of 300 N, determine the maximum load that the jack can lift if

- the piston are at the same level.
 - the large piston is 1m below the smaller, the liquid in the jack being oil with mass density $950 kg/m^3$.
- 4

- [c] Derive relation for hydrostatic force on an inclined surface.

FOURTH SEMESTER

B.E. (EE)

MID SEM EXAMINATION

March- 2007

EE-215 APPLIED THERMODYNAMICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer ALL questions.

Assume suitable missing data, if any.

- 1[a] Define following with physical significance along with applications. 3
- (i) Zeroth law of thermodynamics
 - (ii) First law of thermodynamics
 - (iii) Second law of thermodynamics
- [b] Explain in details the following properties 4½
- (i) Emissivity (ii) Absorptivity (iii) Transmissivity (iv) reflectivity
 - (v) Thermal conductivity (vi) Thermal diffusivity (vii) Specific heats
 - (viii) Enthalpy (ix) Entropy
- 2[a] Explain physical significance of following numbers 4½
- (i) Nusselt number (ii) Prandtl number (iii) Fourier number
 - (iv) Reynolds number (v) Grashof number (vi) Stanton number
 - (vii) Biot number (viii) Geometric number (ix) Compression ratio
- [b] Explain various thermodynamics processes along with applications. 2½
- (i) Constant volume process (ii) Constant pressure processes
 - (iii) Isothermal processes (iv) Isentropic process
 - (v) Polytropic process
- 3[a] Explain thermodynamic differences between following cycles along with P-V and TS diagram. 4
- (i) Carnot cycle Vs Sterling cycle
 - (ii) Otto cycle Vs Carnot cycle
 - (iii) Joule cycle Vs Diesel cycle
 - (iv) Atkin cycle Vs Otto cycle
- [b] Explain various modes of heat transfer and also various law involved in terms of electrical analogies. 1½

