

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Solve any **three** questions from remaining questions.
(3) Assume **suitable data** wherever **necessary**.
(4) **Figures** indicate marks.

1. (a) What is Data structure and Abstract Data Type? 2
(b) What is AVL tree? Give example. 3
(c) What is recursion? State its advantages and disadvantages. 3
(d) What is Expression tree? Give example. 3
(e) What is Link List? State the different types of Link List. 3
(f) List out the properties of a asymptotic notations. 3
(g) What is Data structure for Graphs ? Explain. 3

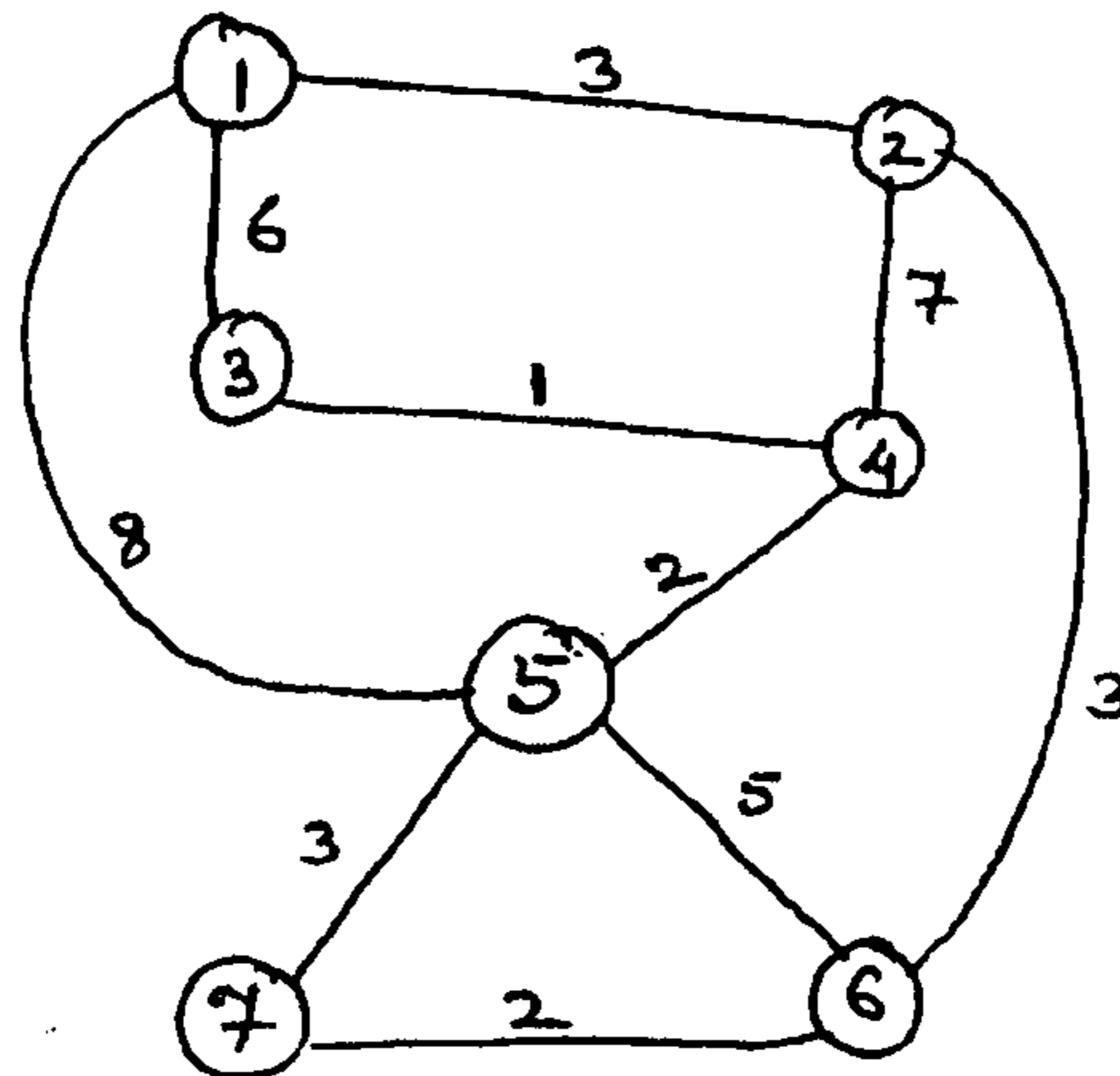
2. (a) What is Doubly Linked List? Write an algorithm to implement following operations:- 10
 - (i) Insertion (All cases)
 - (ii) Traversal (Forward and Backward)

- (b) Define Binary search tree. Write an algorithm to implement Insertion and Deletion operation. 10

3. (a) Write a program to implement queue using array. 10
(b) Explain in brief insertion sort and shell sort. 10

4. (a) Explain in brief:- 10
 - (i) Directed Graph
 - (ii) Weighted Graph
 - (iii) Minimum spanning tree
 - (iv) Adjacency Matrix representation
 - (v) Adjacency List representation

- (b) Find Minimum spanning tree for following graph using Prim's and krusal algorithm. **10**
Show various steps.



5. (a) Write a program to convert INFIX expression into POSTFIX expression. **10**
- (b) Write a program to create singly Linked List and display the List. **10**
6. (a) Write a program to implement a stack ADT using linked list. **10**
- (b) What is an AVL tree? Construct the AVL tree for following set of data. [Mention the type of rotation for each case]. **10**
1, 2, 3, 4, 8, 7, 6, 5, 11, 10, 12.

Con. 9817-13.

GX-12167

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Solve any **three** questions out of **remaining** questions.
 (3) Assume **suitable** data if **necessary**.

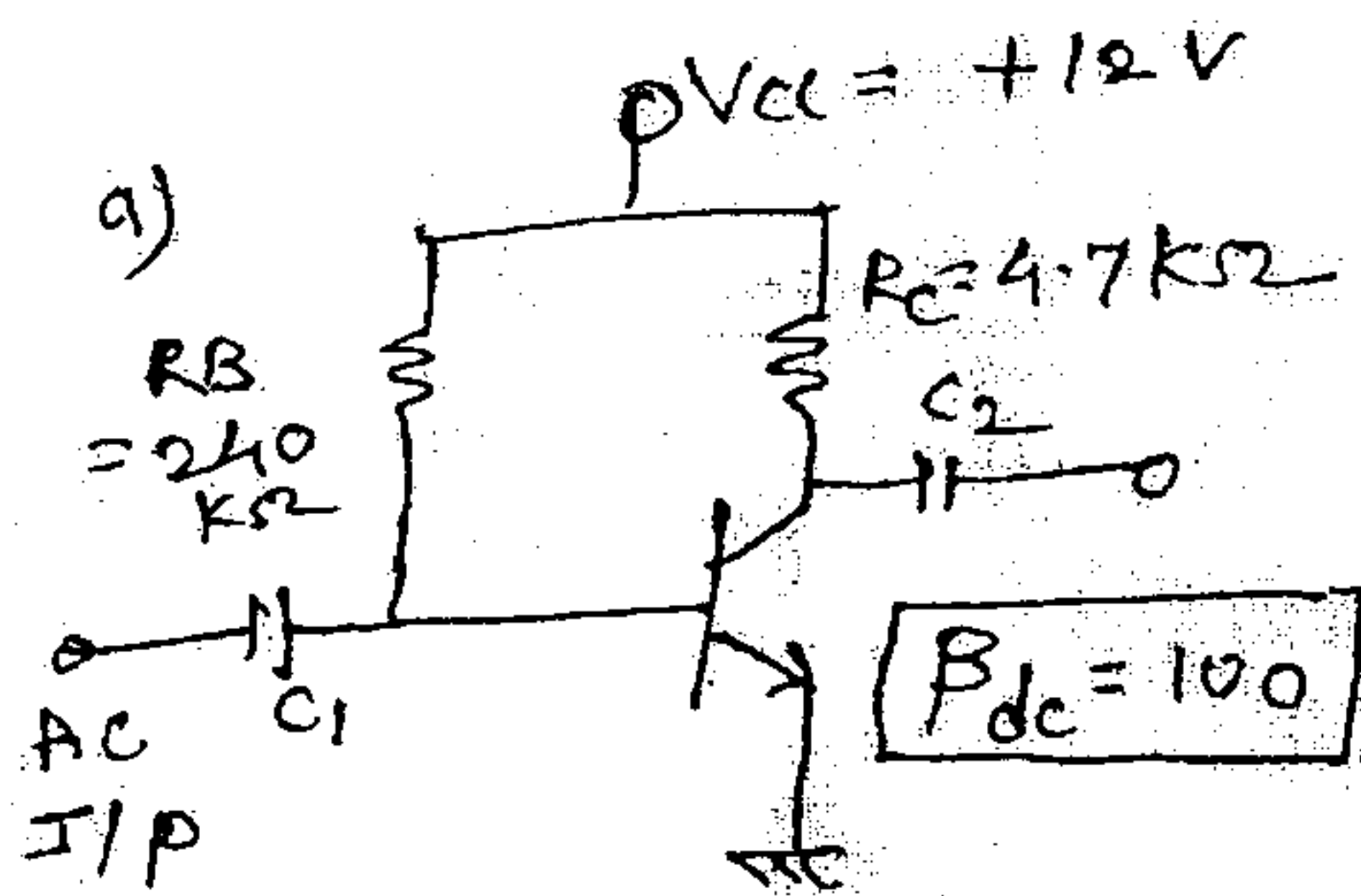
1. Solve any **four** :-

20

- Find out relations between α, β and γ as current amplification factors for CE, CB, CC configurations.
- State ideal and practical characteristics of Op-Amp.
- Convert following decimal number to Binary, Octal, Herl-equivalent and gray code.
 - $(306.8)_{10}$
 - $(147.8)_{10}$
- Add $(57)_{10}$ and $(26)_{10}$ in BCD.
- Convert S-R filp-flop to D-flip-flop.
- Explain parallel input, serial output shift register.

2. (a) Determine the following for the fixed bias

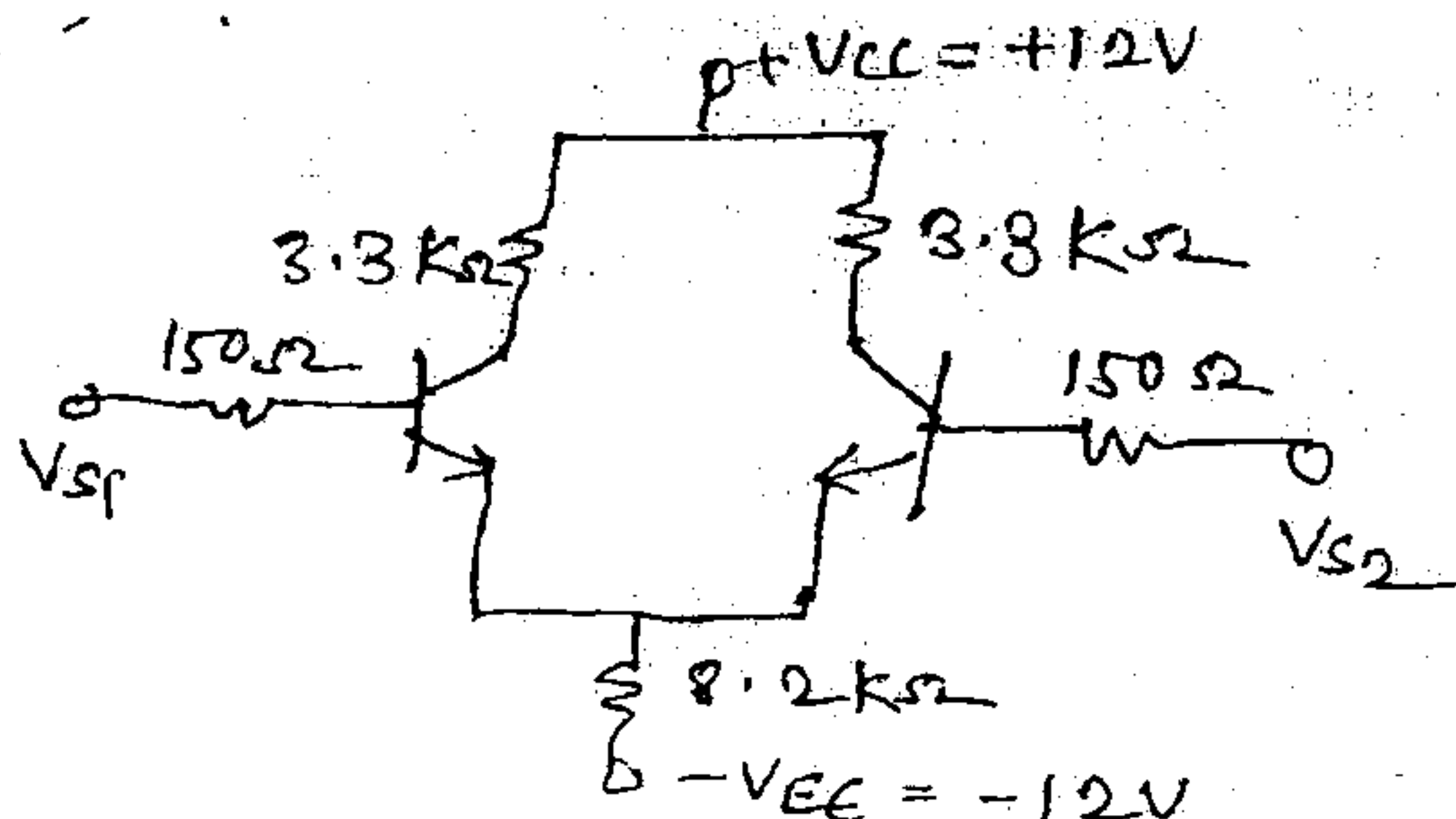
8



- I_{BQ} and I_{CQ}
- V_{CEQ}
- V_B and V_C
- V_{BC}

(b) For the differential amplifier as shown below calculate :-

8



- Operating points
- Voltage gain
- Input Impedance
- Output impedance

(c) Design a circuit to $V_0 = 15(V_1 - V_2)$ where V_1 and V_2 are input voltages to Op-Amp.

4

- What are different methods used to improve CMRR in differential amplifier?
- Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to about 5 KHz.
- Explain Instrumentation amplifier using 3 Op-Amps.

8

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4. (a) Design an astable multivibrator for an output frequency of 1KHz and duty cycle 40 %. **6**
- (b) Minimize the following expression using K-map and realize using the gates. **6**
- $$Y = \sum m (1, 2, 9, 10, 11, 15, 15)$$
- (c) Design 2 - Bit magnitude comparator using basic gates. **8**
5. (a) Implement the following function using 8 : 1 MUX **6**
- $$f (A, B, C, D) = \sum m (2, 4, 5, 7, 10, 15)$$
- (b) Implement full adder using demultiplexer. **6**
- (c) Design the divide by 7 (mod-7) asynchronous up-counter using J-K flip-flop. **8**
- Also state difference between synchronous and asynchronous counter.
6. (a) Explain universal shif register and its applications. **6**
- (b) Explain VHDL. **4**
- (c) What is Zener shunt regulator? Explain and derive stability factor. **4**
- (d) Realize following using only NAND gates. **6**
- $$Y = (AB + BC) C.$$

(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Solve any **three** questions out of remaining **five**.

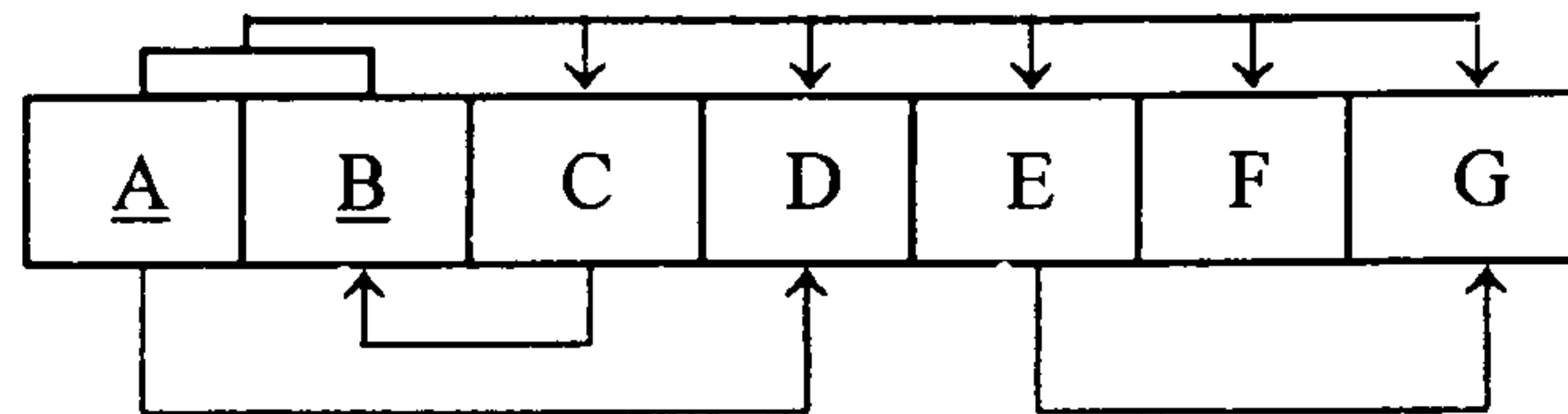
1. (a) Define Data Independence and explain types of data Independence. 5
 (b) List all Functional dependencies satisfied by the relation. 5

A	B	C
a ₁	b ₁	c ₁
a ₁	b ₁	c ₂
a ₂	b ₁	c ₁
a ₂	b ₁	c ₃

- (c) Explain Generalization and Specialization. 5
 (d) Explain the steps in query processing. 5
2. (a) Explain the steps of an algorithm for ER to relational mapping. 10
 (b) Explain different Integrity constraints. 10
3. (a) Draw an E-R diagram for a university database consisting of 4 entities. 10
 (i) Student
 (ii) Department
 (iii) Class
 (iv) Faculty and convert it to tables.
 • A student has a unique id, the student can enroll for multiple classes and has at most one major.
 • Faculty must belong to department and faculty can take multiple classes.
 • Every student will get a grade for the class he/she was enrolled.
- (b) Draw and Explain Database system structure. 10
4. (a) Consider the following employee database. 10
 Employee (empname, street, city, date_of_joining)
 Works (empname, company_name, salary)
 Company (company_name, city)
 Manages (empname, manager_name).
 Write SQL queries for the following statements :-
 (i) Modify the database so that 'John' now lives in 'Mumbai'.
 (ii) Give all employees of 'ABC Corporation' a 10% raise.
 (iii) List all employees who live in the same cities as their managers.
 (iv) Find all employees who earn more than average salary of all employees of their company.
- (b) Explain Time-stamp ordering protocol. 10

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5. (a) Consider a dependency diagram of relation R and normalize it up to third normal form. **10**



- (b) Explain log-based Recovery. **10**
6. (a) Draw a query tree for the following SQL query. **10**
- Select P.Pnumber, P.Dnum, E.Lname, E.Address, E.Bdate.
 From Project as P, Department as D, Employee as E.
 Where P.Dnum = D.Dnumber
 AND D.Mgr_ssn = E.ssn.
 AND P.Plocation = 'Chennai'.
- (b) Explain following relational algebra operations with proper examples. **10**
- (i) Project
 - (ii) Left outer join.
 - (iii) Division
 - (iv) Rename
 - (v) Natural join.
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(3 Hours)

[Total Marks : 80

- N.B. :** (1) Question No. 1 is **compulsory**.
 (2) Attempt any **three** questions from remaining question.
 (3) **Assume** suitable data if **required**.

1. Attempts any **four** the following :- 20
- (a) What is double spotting ?
- (b) Explain Eye pattern in detail.
- (c) Explain under water acoustic channel.
- (d) Explain low level modulated AM transmitter.
- (e) Compare FDM and TDM.
2. (a) State and prove sampling theorem for low pass band limited signal. 8
- (b) Explain balanced modulator using FET's. 6
- (c) In an AM radio receiver the loaded Q of the antenna circuit at the input to the mixer is 100. If the intermediate frequency is 455 KHz, calculate the image frequency and its rejection at 1 Mhz. 6
3. (a) Explain what is mean by quantization noise. Explain in detail. 8
- (b) Find the mathematical expression of FM signal. 6
- (c) Draw block diagram of BPSK generation with waveform. 6
4. (a) Calculate the Max. bit rate for a channel having BW 3100 Hz and signal to noise ratio 10dB. 4
- (b) State and prove the following properties of fourier transform 8
- (i) Time shifting
- (ii) Convolution in time domain
- (c) Explain the term :- 8
- (i) Shot noise and equivalent noise tempreature
- (ii) Friiss transmission formula
5. (a) Draw and explain PCM-TDM system. 10
- (b) What are the disadvantages of tuned RF receiver ? Draw the Ckt of a superhetrodyne receiver and explain the same. 10

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Con. 7873 -GX-12089-13.

2

6. (a) Draw nat block diagram of delta modulator and explain it's working. What are the draw backs of delta modulator ? How are they come by ADM ? **8**

(b) Write short not on :- **12**

- (i) Noise triangle.
 - (ii) Pre-emphasis and de-emphasis.
 - (iii) White noise.
 - (iv) Properties of line codes.
-

(3 Hours)

[Total Marks : 80

N.B. : (1) Question No. 1 is **compulsory**.(2) Attempt any **three** from **remaining**.

1. (a) Write a Program in Java to find ${}^n C_r$ and ${}^n P_r$. 5
- (b) What are the applications of wrapper classes? Explain. 5
- (c) Write an applet program to draw circle rectangle and line. 5
- (d) Write a detail note on System · arraycopy (). 5

2. (a) Assume that a bank maintains two kinds of accounts for customers, one called as savings account and the other as current account. The savings account provides compound interest and withdrawal facilities but no cheque book facility. The current account provides cheque book facility but no interest. Current account holders should also maintain a minimum balance and if the balance falls below this level, a service charge is imposed. 8
 Class account stores customer name, account number, and the type of account. Include member functions :-
 - Accept deposit from a customer and update the balance.
 - Display the balance.
 - Compute and deposit interest.
 - Permit withdrawal and update balance.
 - Check for minimum balance, impose penalty and update the balance.
 Draw class diagram for above senario.
- (b) For above problem statement, implement class account, current account and savings account. 8
- (c) Exam association and aggregation with suitable example. 4

3. (a) Write a program to display area of square and rectangle. Make use of interface to define templates of methods to be there in the derive classes. 10
- (b) With the help of suitable example explain multithreading in terms of following:- 10
 - (i) Creating threads, extending the thread class.
 - (ii) Life-cycle of thread.

4. (a) Write a detailed note on exception handling in terms of following :- 10
 - (i) Try-catch.
 - (ii) Finally keyword.
 - (iii) Cathing multiple exception.
 - (iv) Throwing exception.
- (b) Write a java program to find out no. of uppercase and lowercases characters, blank spaces and digits and special characters from string. 10

[TURN OVER

Con. 9983-GX-12209-13.

2

5. (a) Write an interactive program to create a vector object and populate it with names of cities. Program should display and implement following menu choices :- **7**
- Add city : if city name already exists in the vector then program should display appropriate message.
 - Remove city : If city does not exists in vector then program should display appropriate message.
 - Display all : should display contents of vector.
- (b) Compare and contrast overriding method and overloading method with suitable examples. **8**
- (c) Draw a sequence diagram that shows the interaction between caller, customer and creditcard for the statement "Customer uses a credit card for doing the payment". **5**
6. Write a short notes on (any **four**) :- **20**
- (a) JVM.
 - (b) Abstract methods and classes.
 - (c) Method overloading.
 - (d) Package.
 - (e) Static data, member and methods.
 - (f) Difference between C++ and Java.
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305, 307

S.E. Comp & I.T. Sem III

CBQS Nov. 13

25/11/13

Sub - A.M. III

shilpa-2nd half-(c)13-33

Con. 7854-13.

GX-12040

(3 Hours)

[Total Marks : 80

- N. B. : (1) Question No. 1 is compulsory.
 (2) Answer any three questions from Q. 2 to Q. 6.
 (3) Each question carry equal marks.
 (4) Non-programmable calculator is allowed.

1. (a) Find $L^{-1} \left\{ \frac{e^{4-3s}}{(s+4)^{5/2}} \right\}$ 9 5

(b) Find the constant a, b, c, d and e If. 5

$f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic.

(c) Obtain half range Fourier cosine series for $f(x) = \sin x$, $x \in (0, \pi)$. 5

(d) If r and \bar{r} have their usual meaning and a is constant vector, prove that 5

$$\nabla \times \left[\frac{a \times \bar{r}}{r^n} \right] = \frac{(2-n)}{r^n} a + \frac{n(a \cdot \bar{r}) \bar{r}}{r^{n+2}}$$

2. (a) Find the analytic function $f(z) = u + iv$ If $3u + 2v = y^2 - x^2 + 16xy$. 6

(b) Find the z - transform of $\{a^{|k|}\}$ and hence find the z - transform of $\left\{ \left(\frac{1}{2} \right)^{|k|} \right\}$ 6

(c) Obtain Fourier series expansion for $f(x) = \sqrt{1 - \cos x}$, $x \in (0, 2\pi)$ and hence 8

deduce that $\sum_{n=1}^{\infty} \frac{1}{4n^2 - 1} = \frac{1}{2}$.

3. (a) Find :-

(i) $L^{-1} \left\{ \frac{s}{(2s+1)^2} \right\}$ 3

(ii) $L^{-1} \left\{ \log \frac{s^2 + a^2}{\sqrt{s+b}} \right\}$ 3

(b) Find the orthogonal trajectories of the family of curves $e^{-x} \cos y + xy = \alpha$ 6
 where α is the real constant in xy - plane.

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Con. 7854-GX-12040-13.**2**

(c) Show that $\vec{F} = \left(y e^{xy} \cos z \right) \mathbf{i} + \left(x e^{xy} \cos z \right) \mathbf{j} - \left(e^{xy} \sin z \right) \mathbf{k}$ is irrotational and **8**

find the scalar potential for \vec{F} and evaluate $\int_c \vec{F} \cdot d\mathbf{r}$ along the curve joining the points $(0, 0, 0)$ and $(-1, 2, \pi)$.

4. (a) Evaluate by Green's theorem. $\int e^{-x} \sin y dx + e^{-x} \cos y dy$ where c is the rectangle **6**

whose vertices are $(0, 0)$, $(\pi, 0)$, $(\pi, \frac{\pi}{2})$ and $(0, \frac{\pi}{2})$.

(b) Find the half range sine series for the function. **6**

$$f(x) = \frac{2kx}{l}, \quad 0 \leq x \leq \frac{l}{2}$$

$$= \frac{2k}{l}(l-x), \quad \frac{l}{2} \leq x \leq l$$

(c) Find the inverse z-transform of $\frac{1}{(z-3)(z-2)}$ **8**

(i) $|z| < 2$

(ii) $2 < |z| < 3$

(iii) $|z| > 3$.

5. (a) Solve using Laplace transform. $\frac{d^2 y}{dx^2} + 4 \frac{dy}{dx} + 3y = e^{-x}$, $y(0) = 1$, $y'(0) = 1$. **6**

(b) Express $f(x) = \frac{\pi}{2} e^{-x} \cos x$ for $x > 0$ as Fourier sine integral and show that **6**

$$\int_0^{\infty} \frac{w^3 \sin wx}{w^4 + 4} dw = \frac{\pi}{2} e^{-x} \cos x.$$

(c) Evaluate $\iiint_s \vec{F} \cdot \mathbf{n} ds$, where $\vec{F} = x\mathbf{i} - y\mathbf{j} + (z^2 - 1)\mathbf{k}$ and s is the cylinder formed **8**

by the surface $z = 0$, $z = 1$, $x^2 + y^2 = 4$, using the Gauss - Divergence theorem.