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10EC/TE61

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018

Digital Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. State and prove sampling theorem of low pass signal. Draw the diagrams of G(f) and sampled signal $G_\delta(f)$. Derive interpolation formula for reconstruction of original signal. **(12 Marks)**

b. A signal $g(t) = 2\cos(400\pi t) + 6\cos(640\pi t)$ is ideally sampled at 500 Hz. If the sampled signal pass through an ideal LPF with a cutoff frequency of 400 Hz, what components will appear in the filter output? **(06 Marks)**

c. What is 'aperture effect'? How is it eliminated? **(02 Marks)**

2 a. Derive an expression for maximum signal to quantization noise ratio for PCM system that employs linear quantization technique. Show that normalized signal quantization noise ratio in dB is given by $(SNR)_{dB} = 4.8 + 6N$. **(08 Marks)**

b. Explain the need for non-uniform quantization. Also explain μ-law and A-law companding. **(08 Marks)**

c. Three independent message sources of bandwidth 1 kHz, 1 kHz, 2 kHz respectively are to be transmitted using TDM scheme. Determine the speed of commutator if each signal is sampled at Nyquist rate. Also find minimum transmission band width. **(04 Marks)**

3 a. With neat diagrams, explain the operation of Delta modulation. Mention the drawbacks of delta modulation. **(08 Marks)**

b. For the binary bit sequence 1001001 draw the waveforms using:
i) Unipolar NRZ ii) Unipolar RZ
iii) Bipolar NRZ iv) Manchester coding waveform. **(04 Marks)**

c. Obtain power spectral density of NRZ unipolar format and draw its normalized PSD. **(08 Marks)**

4 a. Describe Nyquist's criteria for distortionless baseband transmission. **(06 Marks)**

b. Define ISI. Write a brief note on eye pattern. **(08 Marks)**

c. Explain briefly the need for a precoder in a duo binary signaling. For the binary sequence 001101001, obtain precoded sequence, duobinary encoder output and recovered output. **(06 Marks)**

PART – B

5 a. Derive an expression for probability of error 'Pe' of a coherent binary ASK. **(10 Marks)**

b. A binary FSK system transmits data at a rate of 2 Mbps over an AWGN channel. The noise is zero mean with PSD, $\frac{NO}{2} = 10^{-20}$ W/Hz. The amplitude of received signal in the absence of noise is 1 μv. Determine the average probability of error for coherent detection of FSK. Take $\text{erfc}\sqrt{6.25} = 0.00041$. **(06 Marks)**

c. A binary data stream 101101 is to be transmitted using DPSK. Determine the encoded and decoded output. **(04 Marks)**

6 a. With a diagram, explain the model of digital communication system. **(06 Marks)**

b. What do you mean by an optimum receiver with reference to a digital modulation scheme? Write the scheme of a correlation receiver and describe its feature. **(08 Marks)**

c. Find the output of the matched filter and determine the maximum SNR at output if the input S(1) is a rectangular pulse of amplitude A and duration T. **(06 Marks)**

7 a. Write a brief note on maximum-likelihood detector. **(06 Marks)**

b. Explain briefly about adaptive equalization. **(06 Marks)**

c. Three signals $S_1(t)$, $S_2(t)$ and $S_3(t)$ are equiprobable and are given by

$$S_1(t) = \sqrt{\frac{2}{T}} \cos\left(\frac{4\pi t}{T}\right) \quad 0 \le t \le T$$

$$S_2(t) = \sqrt{\frac{2}{T}} \cos\left(\frac{8\pi t}{\pi}\right) \quad 0 \le t \le T$$

$$S_3(t) = \sqrt{\frac{2}{T}} \cos\left(\frac{12\pi t}{\pi}\right) \quad 0 \le t \le T$$

i) Sketch the signal space and decision boundaries for this set of signals.

ii) Show that signal space can be reduced to two dimensions. **(08 Marks)**

8 a. With neat diagram, explain direct sequence spread spectrum system. Write the formula to find processing gain, average probability of error. **(06 Marks)**

b. A PN sequence is generated using 4-stage linear feedback shift register as shown in Fig.Q8(b) with initial condition $C_3C_2C_1C_0 = 1000$. This sequence is used in a slow FH/MFSK system.

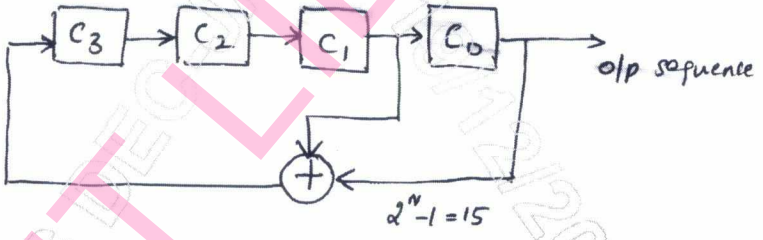

Fig.Q8(b)

Determine the following:

i) Period of PN sequence.

ii) PN sequence for one periodic length.

iii) Verify the three properties of PN sequence. **(08 Marks)**

c. In a fast FH/MFSK system, the signal has following parameters:
Number of bits per MFSK symbol K = 2
Number of MFSK segment per hop = 3
Total number of frequency hops = 8
Number of hops per MFSK symbol = 2
Period of PN sequence L = 15

i) Determine the relation between bit rate and chip rate.

ii) Sketch the variation of frequency of transmitted signal with time. Assume binary data sequence to be 01101100 and one period of PN sequence is 111100010011010. **(06 Marks)**

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10EC/TE62

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Microprocessors

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a neat diagram, explain the BIU of the 8086 microprocessor. **(08 Marks)**

b. Explain memory segmentation and advantages of using segment registers. **(06 Marks)**

c. Indicate the addressing modes of the destinations operand and calculate its physical address for the following instructions
   i) MOV wordptr [BX + DI + 3456H], 8ACDH
   ii) ADC [BP + 200H], AX
   Assume DS =4567H, SS = 4000H, BX = 5678H, DI = CDEFH, BP = 69BOH, SP = 64AOH. **(06 Marks)**

2 a. Explain the following machine control instructions :
   i) ESC ii) LOCK prefix iii) WAIT. **(06 Marks)**

b. Explain the following directives :
   i) ALIGN ii) ASSUME iii) EXTERN iv) SHORT v) OFFSET. **(10 Marks)**

c. Write a program sequence that will reverse the contents of the 4 bytes LIST through LIST+3. **(04 Marks)**

3 a. Explain the following string instructions:
   i) SCASB ii) LODSW iii) CMPSB iv) STOSW **(04 Marks)**

b. Write an ALP to convert an ASCII coded decimal number to its binary equivalent. **(10 Marks)**

c. Develop an 8086 ALP to compute ' n_{C_r} ' using recursive procedure. Assume 'n' and 'r' to be positive integers (n and r <= 8) and place the result in a memory word location. **(06 Marks)**

4 a. Discuss briefly the types of interrupts in 8086. **(10 Marks)**

b. Write an interrupt service procedure to read characters from an ASCII keyboard on interrupt basic. **(10 Marks)**

PART – B

5 a. Interface 3×4 keyboard to 8086 microprocessor using 8255. Write an ALP with the necessary circuit diagram. **(10 Marks)**

b. Discuss briefly the modes of operations of 8255 and the control word format. **(10 Marks)**

6 a. Draw and explain the bit pattern of control register 8087. **(07 Marks)**

b. Convert -29.563 to long real form. **(03 Marks)**

c. Write an ALP to find mean and standard deviation using 8087 instructions. **(10 Marks)**

7 a. Bring out the differences between minimum mode and maximum mode of 8086. **(04 Marks)**

b. Explain the write cycle timing diagram for minimum mode. **(06 Marks)**

c. Describe briefly the USB and also give the flowchart used to generate USB data. **(10 Marks)**

8 a. Explain the following with respect to Pentium processor :
   i) Branch prediction logic ii) Cache structure iii) Super scalar architecture. **(10 Marks)**

b. Write a short note on :
   i) Special registers of 80386 processor ii) Salient features of 80486 processor. **(10 Marks)**

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10EC63

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Microelectronics Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is channel length modulation? Derive the expression for finite output resistance of an NMOS transistor in saturation region. **(08 Marks)**

b. Calculate the value of r_{DS} obtained for a device having $K'_a = 100\,\mu A/V^2$ and W/L = 10 when operated with an overdrive voltage of 0.5V. Assume transistor is opening in triode region. **(04 Marks)**

c. Explain any three Biasing circuits in MOS amplifier. **(08 Marks)**

2 a. From the small signal operation of an amplifier, derive the expression for i) DC bias point ii) Signal current in the drain terminal iii) transconductance and iv) Voltage gain. **(08 Marks)**

b. A transistor amplifier is fed with a signal source having an open circuit voltage V_{sig} of 10mV and an internal resistance R_{sig} of 100kΩ. V_i and V_o are measured both without and with a load resistance R_L = 10kΩ connected to the amplifier output. The measured result are as follows :

	V_i (mv)	V_o (mv)
With R_L	8	70
Without R_L	9	90

Find: i) A_v ii) A_{vo} iii) G_v and iv) G_{vo}. **(04 Marks)**

c. With a neat circuit diagram and small signal model of common drain amplifier prove that $A_{vo} = 1$ and $G_v = 1$. **(08 Marks)**

3 a. For the high frequency equivalent circuit of a common source MOSFET amplifier shown in Fig. Q3(a) having R_{sig} = 100KΩ, R_{in} = 420KΩ, $C_{gs} = C_{gd}$ = 1pF, g_m = 4 MA/V and R'_L = 3.33KΩ. Find the midband voltage gain $A_m = \frac{V_o}{V_{sig}}$ and upper 3dB frequency.

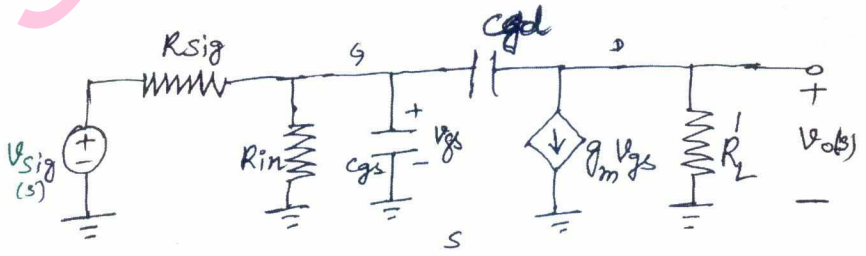

Fig Q3(a) **(08 Marks)**

b. What is scaling of MOSFET? Explain two types of scaling with examples. **(04 Marks)**

c. With a neat circuit diagram, explain the basic MOSFET current source and MOSFET current steering circuit. **(08 Marks)**

4 a. Derive the expression for R_{in}, G_{vo}, A_v and G_v of common gate amplifier with active load. **(10 Marks)**

b. Consider a CC-CE amplifier such that in Fig Q4(b) with the following specifications. $I_1 = I_2 = 1mA$, and identical transistors with $\beta = 100$, $f_T = 400MHz$ and $C_\mu = 2pF$. Let the amplifier be fed with a source V_{sig} having a resistance $R_{sig} = 4K\Omega$ and $r_e = 25m\Omega$. Assume a load resistance of $4K\Omega$, $g_m = 40mA/V$. Find the voltage gain A_m. **(10 Marks)**

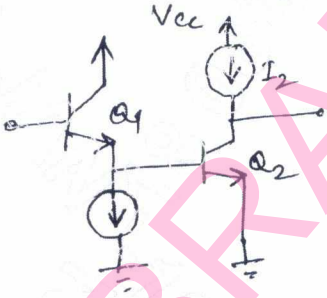

Fig Q 4(b)

PART – B

5 a. Derive the expression for common mode gain common mode rejection ratio of the MOS Differential amplifier. **(10 Marks)**

b. With a neat circuit diagrams explain the working of active loaded MOS Differential pair. **(10 Marks)**

6 a. With a neat block diagram, explain the General structure of feedback. **(08 Marks)**

b. Explain the effect of phase margin on closed loop response and hence prove that $|A_f(jw_1)| = \frac{1.3}{\beta}$. **(04 Marks)**

c. Explain the properties of Negative feedback. **(08 Marks)**

7 a. With neat circuit diagram, explain the working of instrumentation amplifier. **(08 Marks)**

b. Consider the inverting configuration with $R_1 = 1K\Omega$ and $R_2 = 100K\Omega$. Find the closed loop gain for the cases $A = 10^3$ and 10^4. In each case determine the percentage error in the magnitude of G relative to the ideal value of R_2/R_1 (contain with $A = \infty$) Also determine the voltage V_1 that appears at the inverting terminal when $V_i = 0.1V$. **(06 Marks)**

c. With a neat circuit diagram explain the working of antilogarithmic amplifier. **(06 Marks)**

8 a. Explain Digital IC technology and logic circuit families. **(08 Marks)**

b. From the VTC curve, explain the static operation of CMOS invertors. **(06 Marks)**

c. With example explain the working of CMOS logic gate circuit. **(06 Marks)**

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Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define the following with respect to antenna :
i) Directivity
ii) Radiation pattern
iii) Effective aperture
iv) Antenna field zones. **(08 Marks)**

b. Derive the relation between maximum effective aperture and directivity. **(06 Marks)**

c. The effective apertures of transmitting and receiving antennas in a communication system are $8\lambda^2$ and $12\lambda^2$ respectively, with a separation of 1.5km between them. The electromagnetic wave is travelling with a frequency of 6MHz and the total input power is 25KW. Find the power received by the receiving antenna. **(06 Marks)**

2 a. Derive an expression for the total field and plot the field pattern for two isotropic point sources with same amplitude and equal phase spaced $\lambda/2$ apart. **(08 Marks)**

b. A linear array consists of 4 isotropic point sources. The distance between the adjacent elements is $\lambda/2$. The power is applied with equal magnitudes and a phase difference – dr. Obtain the field pattern and find BWFN (Beam width first Null) and HPBW. **(08 Marks)**

c. What are broadside and End fire arrays. **(04 Marks)**

3 a. A magnetic field strength of 5μA/m is required at a point on $\theta = \pi/2$, 2km away from an antenna in free space. Neglecting ohmic loss, how much power must the antenna transmit if it is,
i) A hertzian dipole of length $\lambda/25$?
ii) A half wave dipole?
iii) A quarter wave monopole? **(08 Marks)**

b. Derive the radiation resistance of short dipole. **(06 Marks)**

c. Explain basic concept of folded dipole antenna and show how impedance transformation is possible using folded dipole. **(06 Marks)**

4 a. Derive an expression for the far field components of a loop antenna. **(08 Marks)**

b. Show that the radiation resistance of a small loop antenna consisting 'N' turns is given by

$$R_{rad} = 31200\left(\frac{NA}{\lambda^2}\right)^2 \Omega.$$ **(08 Marks)**

c. Write short notes on slot antenna. **(04 Marks)**

PART – B

5 a. Explain with a neat figure the working of a Yagi–uda antenna. Mention the general characteristics and salient features of Yagi – uda antenna. **(10 Marks)**

b. A parabolic dish provides a power gain of 50dB at 10 GHz with 70% efficiency. Find out, i) HPBW ii) BWFN iii) Diameter. **(06 Marks)**

c. Write a note on Lens antenna. **(04 Marks)**

6 a. Write a note on :
   i) Ultra wideband antennas
   ii) Turnstile antenna. **(08 Marks)**

b. Discuss the design considerations of an antenna used for satellite communications. **(08 Marks)**

c. Discuss briefly about antennas for ground penetrating radar. **(04 Marks)**

7 a. Describe ground wave propagation. **(08 Marks)**

b. Derive an expression for resultant electric field strength (E_R) at a point due to space wave propagation. **(06 Marks)**

c. The transmitting and receiving antennas with heights 50metre and 25metre are used to establish a communication link at 150MHz with 100 watts power of transmission. Determine : i) LOS distance ii) strength of received signal. **(06 Marks)**

8 a. Define Maximum Usable Frequency (f_{MUF}). Derive an expression of f_{MUF} for curved surface of earth. **(08 Marks)**

b. Explain skip distance. Derive an expression for skip distance (D), for flat earth surface. **(06 Marks)**

c. Assume that reflection takes place at a height of 400 km and that the maximum electron density in the ionosphere corresponds to a 0.9 refractive index at 10 MHz. What will be the range for which MUF is 10 MHz? i) for flat earth ii) for curved earth. **(06 Marks)**

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10EC65

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Operating Systems

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is distributed systems? Discuss the key concepts techniques and benefits of distributed operating systems. **(10 Marks)**

b. Explain the goals of an operating system and its operation. **(06 Marks)**

c. Discuss the common tasks performed by an operating systems. **(04 Marks)**

2 a. Explain virtual machine operating system. What are the advantages of using virtual machine? **(10 Marks)**

b. Define the following with respect to an operating systems.
i) Policies and mechanisms
ii) Portability and extensibility. **(06 Marks)**

c. Explain the functions of an operating systems. **(04 Marks)**

3 a. Explain event handling pertaining to a process. **(08 Marks)**

b. Explain with neat diagram
i) User level thread
ii) Kernel level thread. **(08 Marks)**

c. Define a process. List the different fields of process control block. **(04 Marks)**

4 a. What is memory fragmentation? What are the different forms of memory fragmentation? Discuss the method of memory compaction. **(10 Marks)**

b. Compare static and dynamic memory allocation. **(04 Marks)**

c. Compare contiguous and non-contiguous memory allocation methods. **(06 Marks)**

PART – B

5 a. Explain the important concept in the operation of demand paging. **(08 Marks)**

b. Define virtual memory. Compare paging and segmentation with various issues. **(08 Marks)**

c. Explain FIFO page replacement policy. **(04 Marks)**

6 a. Explain sequential and direct file organization. **(08 Marks)**

b. Name the two different classes of files. Explain the various operations performed on files. **(08 Marks)**

c. What are the various fields in the file control block? **(04 Marks)**

7 a. With a neat block diagram, explain about the event handling and scheduling. **(08 Marks)**

b. Define real time scheduling. List the various approaches to real time scheduling. **(04 Marks)**

c. Explain with neat diagram,
i) Priority based scheduling
ii) Round Robin scheduling with time slicing. **(08 Marks)**

8 a. Describe the buffering and delivery of inter process messages with neat diagram. **(10 Marks)**

b. Explain :
i) Direct and indirect naming
ii) Blocking and non – blocking sends. **(10 Marks)**

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10EC662

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Satellite Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. List the services provided by the satellite with frequency band designation. **(08 Marks)**

b. Define the terms : i) Inclination ii) Sub satellite path iii) Perigee iv) Apogee. **(04 Marks)**

c. Determine the limits of visibility for an earth station situated at mean sea level at latitude 54.42°N and longitude 102.20°w. Assume minimum angle of elevation of 5°. **(08 Marks)**

2 a. State and explain with necessary diagram and equations Kepler's three laws of motion. **(10 Marks)**

b. Determine the angle of tilt required for a polarmount used with an earth station at latitude 54°N. Assume spherical earth of mean radius 6371 km and ignore earth station altitude. **(06 Marks)**

c. List Kepler's elemental set. **(04 Marks)**

3 a. Explain Atmospheric and Ionospheric losses in satellite communication. **(06 Marks)**

b. An unlink operates at 14GHz and flux density required to saturate the transponder is $-120B(w/m^2)$. The free space loss is 207dB and other propagation losses amount to 2dB. Calculate the earth station [EIRP] required for saturation, assuming clear sky conditions. Assume [RFL[is negligible. **(06 Marks)**

c. Calculate for a frequency of 12GHz and for horizontal and vertical polarization, the rain attenuation which is exceeded for 0.01 percent of the time in any year, for a point rain rate at 10mm/h, the earth station attitude is 600m and the antenna, elevation angle is 50°, the rain height is 3km and ah > 0.0188, $a_v = 0.0168$, $b_h = 1.217$, $b_v = 1.2$.
Note : All heights and lengths are in KM and rain rate is mm/h. **(08 Marks)**

4 a. Explain momentum wheel stabilization of satellite. **(07 Marks)**

b. Briefly explain TT and C subsystems. **(06 Marks)**

c. Explain satellite transponder. **(07 Marks)**

PART – B

5 a. Explain the DBSTV/FM reception. **(06 Marks)**

b. Describe the community antenna TV system. **(06 Marks)**

c. Explain with figure preassigned FDMA. **(08 Marks)**

6 a. Explain onboard signal processing for FDMA/TDM operation. **(07 Marks)**

b. Briefly explain spade system with chanelising scheme. **(06 Marks)**

c. Explain satellite switched TDMA. **(07 Marks)**

7 Explain the following :

a. Transponder capacity **(07 Marks)**

b. Bit rate digital TV **(07 Marks)**

c. Frequency and polarization. **(06 Marks)**

8 a. Explain global positioning system in detail. **(08 Marks)**

b. Describe the operation of VSAT system and application. **(06 Marks)**

c. Explain Radarsat. **(06 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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10EC665

Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Programming in C++

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. What are preprocessor directives? List the different types and explain their use. **(06 Marks)**

b. Explain dynamic memory allocation in C++. What is memory leak? **(06 Marks)**

c. With the help of a general class structure, explain in detail object based design. **(08 Marks)**

2 a. What is variable? What are the accepted conventions of naming a variable? **(05 Marks)**

b. Explain the difference between the following literal constants :
i) 12.345L ii) 024 iii) L "a" iv) 1024UL v) 2.56F. **(05 Marks)**

c. Explain the following terms with example :
i) pointer arithmetic
ii) class scope operator
iii) const qualifies
iv) reference variables
v) Enum. **(10 Marks)**

3 a. Differentiate implicit and explicit type conversion. Give atleast three general program situations when implicit type conversions happen. **(08 Marks)**

b. Write a program to accept ten numbers from the user and print the sum and average of them. **(08 Marks)**

c. Differentiate between the while and do-while looping constructs. **(04 Marks)**

4 a. What are functions? Explain the general structure of functions in C++. **(08 Marks)**

b. Explain different ways of argument passing in a function with the help of swap( ). (function to swap two numbers). **(12 Marks)**

PART – B

5 a. What are exceptions? What is the mechanism given by C++ to handle them? **(05 Marks)**

b. Write a C++ program to handle :
i) Divide by zero
ii) Stack full exception. **(10 Marks)**

c. Explain the flow of the program on occurrence of an exception. **(05 Marks)**

6 a. Using the general structure of class, explain how information hiding is implemented in C++. **(08 Marks)**

b. Explain the following with examples :
i) Class constructor
ii) Class destructor
iii) Default constructor. **(09 Marks)**

c. Explain the following definition class Accounts{ }, Account Name [10]. **(03 Marks)**

7 a. Explain how ++ and – – operators can be overloaded using a sample class. **(12 Marks)**

b. Differentiate the following definitions for class student :

i) Student *S = new student (24) ;

ii) Student *S = new student (10); **(08 Marks)**

8 a. Define class inheritance. How are Public, Private and Protected inheritance implemented. Give an example. **(12 Marks)**

b. Class vehicle {···};
Class two wheeler : public vehicle {···};
Class four wheeler : public vehicle , public two wheeler { };
Explain the scope of inheritance in the above structure. **(08 Marks)**

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