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10EC/TE61

Sixth Semester B.E. Degree Examination, June/July 2015
Digital Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. State sampling theorem. Write the equations for the spectrum of finite energy g(t) sampled at 1/2W sec. and g(f), if W is the highest frequency content of g(t). Sketch g(f) and sampled signal $g_s(f)$. **(08 Marks)**

b. The signal $g(t) = 10 \cos(20\pi t) \cos(200\pi t)$ is sampled at the rate of 250 samples per second.
i) Determine the spectrum of the resulting sampled signal.
ii) Specify the cutoff frequency of the ideal reconstruction filter so as to recover g(t) from its sampled version.
iii) What is Nyquist rate for g(t). **(04 Marks)**

c. Explain how practical sampling is different from ideal sampling. Derive an expression for the flat top sampled signal. **(08 Marks)**

2 a. Derive an expression for output SNR of the quantizer and show that $(SNR)_\theta = 6u - 7.2$ in decibels if a sinusoidal signal is quantized. **(08 Marks)**

b. Explain the need for non-uniform quantization. Also explain μ-law and A-law companding. **(07 Marks)**

c. A signal $M_1(t)$ is band limited to 3.6kHz and three other signals $M_2(t)$, $M_3(t)$ and $M_4(t)$ are band limited to 1.2 kHz. These signals are to be transmitted by means of TDM.
i) Set up a scheme for realizing this multiplexing requirement, with each sampled signal at its Nyquist rate
ii) What must be the speed of the commutator in samples/sec?
iii) Determine the minimum bandwidth of the channel. **(05 Marks)**

3 a. For the given binary sequence 101000110101, draw the digital format waveform corresponding to i) ON-OFF signaling; ii) RZ bipolar signaling; iii) Manchester code; iv) NRZ polar signaling; v) NRZ bipolar signaling. **(05 Marks)**

b. What is the differences between PCM and DPCM? Briefly explain the operation of DPCM system with neat block diagram along with relevant expressions. **(08 Marks)**

c. Derive an expression for power spectral density of bipolar NRZ format and plot the same with respect to frequency. **(07 Marks)**

4 a. Explain the following terms with related equations and diagram with respect to baseband data transmission: i) ISI ii) Raised cosine spectrum. **(10 Marks)**

b. Draw and explain modified duo binary techniques. Specify how the error propagation is eliminated. **(07 Marks)**

c. A multilevel digital communication system transmits one of the sixteen possible levels over the channel every 0.8 μs.
i) What is the minimum number of bits corresponding to each level?
ii) What is baud rate?
iii) What is bit rate? **(03 Marks)**

PART – B

5 a. Draw the block diagram for QPSK transmitter and receiver. From the basic principles prove that BER for QPSK is $\frac{1}{2}\text{erfc}\left(\sqrt{\frac{E_b}{N_o}}\right)$. **(10 Marks)**

b. Explain in detail along with the block diagram a coherent FSK tansmitter and receiver. **(06 Marks)**

c. The data transferred in PSK is with data rate of 1Mbps. It is desired to have $P_e \leq 10^{-4}$ with PSD at 10^{-12} N/Hz. Determine average carrier power required at the receiver input if the detector is coherent. erfc(3.5) = 0.002. **(04 Marks)**

6 a. With a conceptualized model of digital communication system, explain Gram-Schmidt orthogonalization procedure. **(10 Marks)**

b. Three signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ are as shown in Fig.Q.6(b) below. Apply Gram-Schmidt procedure to obtain an orthonormal basis for signals. Express the signals $s_1(t)$, $s_2(t)$ and $s_3(t)$ in terms of orthonormal basis function. Also give the signal constellation diagram. **(10 Marks)**

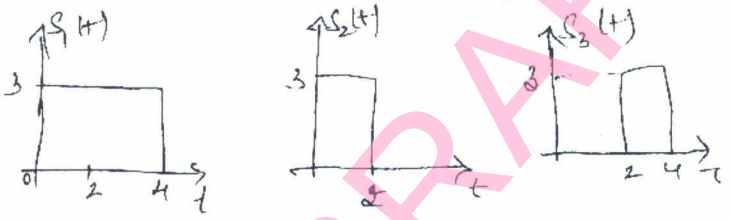

Fig.Q.6(b)

7 a. Explain the properties of matched filter. **(10 Marks)**

b. Consider a signal s(t) defined by, $s(t) = \begin{cases} 1 & ; \ 0 \leq t \leq T \\ 0 & ; \ \text{elsewhere} \end{cases}$. It is proposed to approximate the matched filter for this signal by a lowpass RC filter defined by the transfer function $H(f) = \frac{1}{1 + j(f/f_o)}$, where $f_o = \frac{1}{2\pi RC}$ is the cutoff frequency of RC filter.

i) Determine optimum value of f_o for which the RC filter becomes the best approximation for matched filter.

ii) Determine the peak o/p signal to noise ratio assuming noise is AWG of zero mean and power density $N_o/2$.

iii) Determine by how many decibels the transmitted energy be increased so that the performance becomes same as that of perfectly matched filter. **(10 Marks)**

8 a. Explain the properties of maximum length sequence for a sequence generated from 3-voltage shift register with linear feedback. Verify these properties for the PN sequence 01011100101110 and also determine the period of the given PN sequence. **(08 Marks)**

b. Explain the principle of direct sequence spread spectrum system. **(05 Marks)**

c. Explain with neat block diagram the working of frequency hop transmitter and receiver. **(07 Marks)**

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10EC/TE62

Sixth Semester B.E. Degree Examination, June/July 2015
Microprocessors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Write the memory map of the TPA in a personal computer and explain each of the areas in brief. **(10 Marks)**

b. Explain the based, indexed, base indexed and relative addressing modes of 8086 with suitable diagrams and examples. **(10 Marks)**

2 a. Write an assembly language program segment to perform (DX) ← up1 + up2 – up3 on two digit 10's complement numbers, where up1, up2 and up3 are unpacked two byte data variable memory locations. **(10 Marks)**

b. Write the flowchart and assembly language program segment to sort numbers in an array A in descending order using bubble sort. Use I as index. **(10 Marks)**

3 a. Write an assembly language program segment to move a block of data between two overlapping areas and explain with diagrams of overlapping. **(10 Marks)**

b. Compare procedure and macro. **(04 Marks)**

c. Write an assembly language program segment to move data from VAR2 to VAR1 and also VAR4 to VAR3 using MOVE MACRO (arguments). **(06 Marks)**

4 a. Draw the interrupt vector table and write the sequence of operations that are performed when an interrupt is recognized. **(10 Marks)**

b. Write the assembly language program segments to set the trap flag and to reset the trap flag. **(06 Marks)**

c. Write the circuit for optically detecting the presence of a new printed circuit –board as it comes out of the machine and keep a count of finished boards, so that we can count any board lost in the machine when a board passes between LED and phototransistor it should signal the NMI input of 8086. Explain the operation of circuit. **(04 Marks)**

PART – B

5 a. Interface a 4 × 4 matrix keyboard to 8086 through 4 – bit output port for rows and 8 – bit input for columns. Draw the flowchart and explain the procedure for key press, de-bounce and encoding of the key pressed. **(10 Marks)**

b. With a neat diagram interface the multiplexed 4 – digit LED display to microcomputer. Explain the principle of operation. **(10 Marks)**

6 a. Draw the block diagram of 8087 and explain. **(10 Marks)**

b. Write the 8087 assembly language program sequence for computing the sample mean and standard deviation and store them at MEAN and STD – DEV respectively where :

$$\text{Standard deviation (STD – DEV)} = \sqrt{\frac{\sum_{i=1}^{N}(X_i - \text{MEAN})^2}{N-1}};$$

$$\text{sample (MEAN)} = \frac{\sum_{i=1}^{N} X_i}{N}; \; x_1, x_2, - - - - - x_N \text{ are samples : N : number of samples.} \quad \textbf{(10 Marks)}$$

7 a. Write the typical minimum mode system configuration of 8086 with necessary devices and interconnections and explain. **(10 Marks)**

b. Write the ALP segment to initialize, read and write the parallel port printer without ECP. **(06 Marks)**

c. Explain the features of USB. **(04 Marks)**

8 a. Discuss the flag register, debug and test registers of 80386. **(06 Marks)**

b. Explain the salient features of 80486. **(06 Marks)**

c. Draw the block diagram of Pentium processor and explain the function of each block. **(08 Marks)**

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10EC63

Sixth Semester B.E. Degree Examination, June/July 2015
Microelectronics Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE questions, selecting THREE from Part-A and TWO from Part-B.***

PART – A

1 a. Derive the $i_D - V_{DS}$ relationship of a MOSFET for triode and saturation region. **(12 Marks)**

b. For a MOSFET process technology with W/L = 8 μm/0.8 μm, t_{ox} = 8nm, $\epsilon_r = 3.9$ $\mu_h = 450$ $cm^2/v.s$ and $v_t = 0.7$ V.

i) Find C_{ox} and K_n'.

ii) Calculate the values of V_{GS} and V_{DSmin} needed to operate the transistor in the saturation region with a dc current $I_D = 100$ μA.

iii) For the device to operate as a 1000 Ω resistor find the value of V_{GS} required for very small V_{DS}. **(08 Marks)**

2 a. Derive the expression for input resistance, output resistance, voltage gain and overall gain of a grounded source amplifier with a neat diagram. **(08 Marks)**

b. Design the biasing circuit shown in Fig.Q.2(b) to establish a drain current $i_D = 0.5$mA.

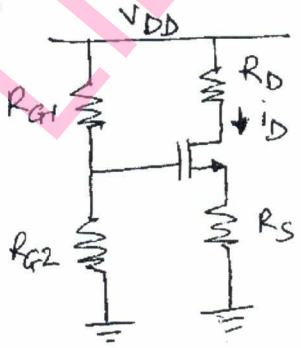

Fig.Q.2(b)

MOSFET has $v_t = 1$V, $k_n'(W/L) = 1\ mA/v^2$ and $V_{DD} = 15$V. Assume one-third V_{DD} across R_D and R_S and neglect channel length modulation $\lambda = 0$. Determine percentage change in value of i_D when MOSFET is replaced with another having $v_t = 1.5$V. **(12 Marks)**

3 a. Explain the operation of a MOSFET current steering circuits with necessary expressions. **(10 Marks)**

b. What is MOSFET scaling? Compare MOSFET parameters before and after scaling in constant field scaling and constant voltage scaling. **(10 Marks)**

4 a. Explain CMOS implementation of CS amplifier and arrive at voltage gain expression $A_v = g_{m1}\ r_{o1}/2$. **(10 Marks)**

b. Derive an expression for the short-circuit transconductance G_m of the MOS cascade amplifier. **(10 Marks)**

5 a. Explain operation of MOS differential pair with common-mode input voltage V_{cm} and determine the highest and lowest value of v_{cm} over which the differential pair operates properly. **(08 Marks)**

b. For a MOS differential pair in Fig.Q.5(b).

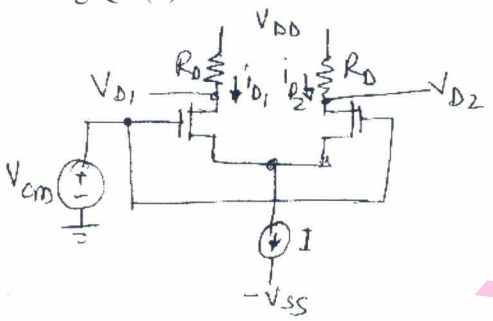

Fig.Q.5(b)

$V_{DD} = V_{SS} = 1.5V$, $k'_n(W/L) = 4mA/V^2$, $v_t = 0.5V$, $I = 0.4mA$, $R_D = 2.5\ K\Omega$ neglect channel length modulation.

i) Find V_{OV} and V_{GS} for each transistor.

ii) What is the highest value of V_{an} for Q_1 and Q_2 to remain in saturation?

iii) If the current source I requires a minimum voltage of 0.4V to operate properly what is the lowest value allowed for V_s and V_{an}? **(12 Marks)**

PART – B

6 a. Discuss with neat diagram the four basic feedback topologies. **(08 Marks)**

b. Explain the properties of negative feedback. **(08 Marks)**

c. What is the general structure of the feedback amplifier? **(04 Marks)**

7 a. Explain the operation and analysis of single op-amp difference amplifier to determine it common mode gain A_{cm}. **(10 Marks)**

b. How op-amp circuits can be used as signal integrator and differentiator and determine the time constants? **(10 Marks)**

8 a. Describe the circuit structure and static operation of CMOS invertor. **(08 Marks)**

b. With example explain PUN and PDN CMOS logic gate circuits. **(08 Marks)**

c. Realize two input NOR gate and two input NAND gate using CMOS gate. **(04 Marks)**

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10EC64

Sixth Semester B.E. Degree Examination, June/July 2015
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: i) Radiation intensity ii) Power density. Derive the relation between these two parameters. **(06 Marks)**

b. Show that the maximum effective aperature of a short dipole antenna is $0.119\ \lambda^2$. **(06 Marks)**

c. Determine the directivity of a system, if the radiation intensity is

i) $U_m \sin\theta \cdot \sin^2\phi$; for $0 \le \theta \le \pi$, $0 \le \phi \le \pi$.

ii) $U_m \sin^2\theta \sin^3\phi$; for $0 \le \theta \le \pi/2$, $0 \le \phi \le 2\pi$. **(08 Marks)**

2 a. State and prove power theorem. How power theorem is applied to find power radiated by an isotropic antenna in terms of it's' radiation intensity? **(06 Marks)**

b. Derive an expression for 'array factor' of an array of n-isotropic sources. **(08 Marks)**

c. A linear antenna array consists of four isotropic sources. The distance between adjacent sources is $\lambda/2$. The power applied to the array is with equal amplitude and a phase difference $-d_r$. Obtain the field pattern and find FNBW and HPBW. **(06 Marks)**

3 a. Derive an expression for radiation resistance of a short electric dipole. **(06 Marks)**

b. Show that the radiation resistance of $\lambda/2$ antenna is 73 ohms. **(06 Marks)**

c. With the help of neat diagrams, explain following antennas:
i) Long-wire antenna ii) Folded dipole antenna. **(08 Marks)**

4 a. Derive the expressions for field strengths E_ϕ and H_θ incase of a small loop. **(08 Marks)**

b. The radius of a circular loop antenna is 0.02λ. How many turns of the antenna will give a radiation resistance of 35Ω? **(06 Marks)**

c. Explain Babinet's principle with illustrations. **(06 Marks)**

PART – B

5 a. Explain different types of rectangular horn antennas. Why flaring of walls of waveguide in case of horn antennas is necessary? **(06 Marks)**

b. Describe a helical antenna with the help of a neat diagram. Explain its two modes of operation with relevant equations. **(08 Marks)**

c. Find number of elements in a log-periodic dipole array with 7dBi gain and a 4 to 1 bandwidth. The scale constant K = 1.2 for apex angle of 15°. **(06 Marks)**

6 a. Explain the construction and working of lens antenna. **(06 Marks)**

b. With neat diagram, explain embedded antenna. **(06 Marks)**

c. Explain following antenna types with neat sketches:
i) Ultra wide band antenna ii) Plasma antenna. **(08 Marks)**

7 a. Derive an expression for space wave field intensity and show that it varies sinusoidally. **(08 Marks)**

b. Explain duct propagation with diagram. **(06 Marks)**

c. A free-space LOS (Line-of-Sight) microwave link operating at 10 GHz consists of a transmit and a receive antenna each having a gain of 25dB. The distance between the two antennas is 30km and the power radiated by the transmit antenna is 10W. Calculate the path loss of the link and the received power. **(06 Marks)**

8 a. Explain the mechanism of ionospheric propagation. Also derive an expression for the refractive index of an ionospheric layer. **(08 Marks)**

b. Discuss the effect of the earth's magnetic field on ionospheric propagation. **(06 Marks)**

c. Calculate the angle of incidence and the maximum single-hop distance for a sky wave reflected from the E-layer with height 'h' = 100 km. **(06 Marks)**

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10EC65

Sixth Semester B.E. Degree Examination, June/July 2015
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. Discuss the common tasks performed by an operating system (OS). **(05 Marks)**

b. Explain the resource preemption, resource allocation strategies of an OS. **(07 Marks)**

c. What is a distributed system? Discuss the key concepts, techniques and benefits of distributed OS. **(08 Marks)**

2 a. Explain the functions of an OS. **(04 Marks)**

b. Explain the kernel based operating system with a structure of time sharing system. **(08 Marks)**

c. Explain the following: i) System generation; ii) Configuration tools; iii) Dynamic configuration of supervisor. **(08 Marks)**

3 a. Discuss the primary concerns/reasons for process termination. **(05 Marks)**

b. List the events occur during the operation of OS. With a diagram discuss the event handling actions of kernel. **(08 Marks)**

c. With a diagram, explain the relationship between threads and processes. Discuss the advantages of threads. **(07 Marks)**

4 a. Explain the lazy buddy allocator and slab allocator. **(08 Marks)**

b. With a diagram, explain the merging of free memory areas using boundary tag. **(08 Marks)**

c. Compare between contiguous and non-contiguous memory allocation. **(04 Marks)**

PART – B

5 a. With a diagram explain the following:
   i) Practical page replacement policy.
   ii) Page replacement policy using clock algorithms. **(09 Marks)**

b. Explain with a diagram, the copy_on_write for shared pages. **(04 Marks)**

c. With a diagram, explain the virtual memory manager's actions in demand loading of a page. **(07 Marks)**

6 a. Explain the following write a diagram:
   i) Linked allocation
   ii) File allocation table
   iii) Indexed allocation. **(10 Marks)**

b. Explain the operations performed on files. **(05 Marks)**

c. Discuss with a diagram the directory trees of a file system. **(05 Marks)**

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

b. Determine the mean turn around time and mean weighted turn around for LCN and STG scheduling for the following table: **(08 Marks)**

Processes	Arrival time (sec.)	Execution time (sec.)	Dead line time (sec.)
P_1	0	03	04
P_2	2	03	14
P_3	3	02	06
P_4	5	05	11
P_5	8	03	12

c. Discuss the two fundamental techniques of scheduling. **(04 Marks)**

8 a. Explain the following:

i) Inter process message control block.

ii) Exceptional conditions on message passing. **(07 Marks)**

b. Explain the message queues and sockets for inter process communication in unix. **(08 Marks)**

c. Explain a mail box with its features and advantages. **(05 Marks)**

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Sixth Semester B.E. Degree Examination, June/July 2015
Satellite Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain frequency allocations for a satellite. **(06 Marks)**

b. State and explain Kepler's three laws of planetary motion. **(06 Marks)**

c. With the help of neat diagram, explain Keplerian orbital elements. **(08 Marks)**

2 a. Explain how a satellite continues to be in orbit and derive expression for:
(i) Satellite velocity (ii) orbital period **(08 Marks)**

b. Define and explain Elevation and Azimuth angles of a ground station antenna for communication with an orbiting satellite. **(06 Marks)**

c. The orbit of an earth orbiting satellite has an eccentricity of 0.15 and semi major axis of 9000kms. Determine : (i) Periodic time (ii) Apogee height (iii) Perigee height. Given $h = 3.986 \times 10^5$ km^3/s^2. Assume a mean value of 6371 kms for earth's radius. **(06 Marks)**

3 a. Explain atmospheric and ionospheric losses for satellite communication. **(04 Marks)**

b. Calculate horizontal, vertical and circular polarizations for a frequency of 12GHz, the rain attenuation is exceeded for 0.01% of the time in any year, for a point rain rate of 10mm/hr. The earth station attitude is 600 meter, and the antenna elevation angle of 50°. The rain height is 3km and $a_h = 0.0188$; $b_h = 1.217$; $a_v = 0.168$; $b_v = 1.2$.
Note : All lengths and heights are in kms, and rain rate is in mm/hour. **(10 Marks)**

c. Explain the following : (i) Antenna Noise Temperature (ii) Amplifier Noise Temperature (iii) System Noise Temperature referred to input. **(06 Marks)**

4 a. With the help of neat diagram, explain two forms of attitude control. **(10 Marks)**

b. What is satellite transponder? With a neat diagram explain the overall frequency arrangement of typical C-band communication satellite. **(06 Marks)**

c. Write a short note on Thermal control. **(04 Marks)**

PART – B

5 a. Explain indoor and outdoor unit of direct Broadcasting satellite TV with block diagram. **(10 Marks)**

b. What is meant by pre-assigned FDMA? With a neat diagram, explain single channel per carrier. **(10 Marks)**

6 a. Explain the concept of TDMA and FDMA using appropriate figures. Discuss the relative advantages and disadvantages of each. **(10 Marks)**

b. The carrier to interference ratio at the ground receiving antenna is 23.3 dB. For the uplink (C/I) ratio is 27.53dB. Find the overall ratio $(C/I)_{ant}$ for $(I/C)_v = 0.001766$ and $(I/C)_D = 0.004436$. **(06 Marks)**

c. What are different interferences that occur in FDMA system? **(04 Marks)**

7 a. Explain (i) Transponder capacity (ii) Frequency and polarization. **(08 Marks)**

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

c. Explain in detail the satellite mobile services. **(06 Marks)**

8 Write short notes on :

a. GPS and its uses

b. Radarsat

c. SPADE system

d. Earth Eclipse of satellites **(20 Marks)**

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10EC665

Sixth Semester B.E. Degree Examination, June/July 2015
Programming in C++

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 preprocessor directive? What are the different types of preprocessor directive used in C++? Explain each with an examples. **(10 Marks)**

b. Mention the differences between procedure oriented programming (POP) and object oriented programming (OOP). **(04 Marks)**

c. What is dynamic memory allocation? How the dynamic memory allocation and deallocation is made in C++? Explain with an examples. **(06 Marks)**

2 a. Explain the following data types of C++ with general syntax and examples :
i) Reference type ii) Enumeration data type iii) Bool type. **(10 Marks)**

b. Write a program in C++ to print the numbers of Fibonacci series upto 100. (Use array to store data). **(06 Marks)**

c. Define pointer. What are the steps to be followed to use pointers? **(04 Marks)**

3 a. What are bitwise operators? Where do you find the role of bitwise operators? **(04 Marks)**

b. How do you classify C++ control statements? Explain different looping statements supported by C++. **(10 Marks)**

c. Write a C++ program to find the roots of a quadratic equation using switch statement. **(06 Marks)**

4 a. What are the advantages of using function? **(04 Marks)**

b. Define argument passing. Explain function argument passing mechanisms (with example program) using swap two integer numbers. **(10 Marks)**

c. What is inline function? Write the syntax of defining inline function and also give example program which illustrate inline function. **(06 Marks)**

PART – B

5 a. What is an exceptions? What are different types of exceptions? **(04 Marks)**

b. What is the purpose of using exception handling mechanism? Explain the C++ exception handling mechanism with programming example. **(10 Marks)**

c. Explain rethrowing an exception with programming example. **(06 Marks)**

6 a. Define a class and class object and also list the salient features of an object. **(06 Marks)**

b. Write a C++ program to define a class called student with roll number, name and percentage as its data members getData( ) and PrintData( ) as member functions. **(06 Marks)**

c. Define constructor, default constructor, parameterized constructors and also list the characteristics of constructor with programming example. **(08 Marks)**

7 a. What is an operator overloading? With the help of general syntax, explain the process of operator overloading. **(10 Marks)**

b. Mention the types of operator that cannot be overloaded. **(02 Marks)**

c. Write a C++ program to overload the ++ and – – operator. **(08 Marks)**

8 a. What is inheritance? How do you define and declare a derived class? Explain with syntaxes and programming examples. **(08 Marks)**

b. Explain the following with reference to oops :
i) Single inheritance ii) Multiple inheritance. **(12 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.