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10EC61

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Digital Communication

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Assume any missing data.***

PART – A

1 a. Show that time shifted Sinc function used in reconstruction of sampled signals i.e Sinc (2Wt – n) are mutually orthogonal. **(06 Marks)**

b. Explain the quadrature sampling with related block diagram, spectra and equations. **(06 Marks)**

c. A Signal g(t) consists of two frequency components $f_1 = 3.9$KHz and $f_2 = 4.1$ KHz in such a relationship that they just cancel each other g(t) is sampled at the instants t = 0, T, 2T, ...

Where T = 125μs. The signal g(t) is defined by $g(t) = \text{Cos}\left(2\pi f_1 t + \frac{\pi}{2}\right) + A\ \text{Cos}\ (2\pi f_2 t + \phi)$

Find the values of amplitude A and ϕ of the second frequency component. **(08 Marks)**

2 a. Explain TDM technique with a neat block diagram and relevant waveforms. **(06 Marks)**

b. The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy of ± 0.1% (full scale)
The analog voltage waveform has a bandwidth of 100Hz and an amplitude range of -10 to +10 volts.
i) Determine the maximum sampling rate required
ii) Determine the number of bits in each PCM word
iii) Determine the minimum bit rate required in the PCM signal
iv) Determine the minimum absolute channel bandwidth required for the transmission of the PCM signal. **(08 Marks)**

c. What is the need for non-uniform quantization? Explain μ-law companding. **(06 Marks)**

3 a. With the block diagrams, explain the Adaptive delta modulation system. **(07 Marks)**

b. A Delta modulation system is tested with a 10-KHz Sinusoidal signal with 1V peak to peak at the input. It is sampled at 10 times the Nyquist rate
i) What is the step size required to prevent slope over load?
ii) What is the corresponding SNR? **(07 Marks)**

c. Present the data 100111010 using the following digital data formats.
i) Unipolar RZ ii) Split phase Manchester ii) M-ary system where m = 4. **(06 Marks)**

4 a. Define intersymbol interference and explain ideal solution for zero ISI with a mathematical scheme. **(08 Marks)**

b. A binary PAM wave is to be transmitted over a low-pass channel with an absolute maximum bandwidth of 75KHz. The bit duration is 10μSec. Find the raised Consine spectrum that satisfies these requirements. **(06 Marks)**

c. Write a note on Adaptive equalization. **(06 Marks)**

PART – B

5 a. With a block diagram, explain the coherent binary FSK – transmitter and receiver. **(10 Marks)**

b. Sketch the inphase and quadrature components of a QPSK signal for the binary sequence 110010111. Assume carrier frequency f_c to be equal to 1/Tb. Draw signal space diagram and QPSK waveform for the given sequence. **(10 Marks)**

6 a. Prove the Gram – Schmidt orthogonalization procedure. **(12 Marks)**

b. Explain geometric interpretation of signals in detail. **(08 Marks)**

7 a. Show that the probability of bit error of a matched filter receiver is given by $P_e = \frac{1}{2}\text{erfc}\sqrt{\frac{E_b}{N_o}}$. **(08 Marks)**

b. Explain the maximum likelihood detector. **(06 Marks)**

c. For the signal s(t) shown below in figure Q7(c)

i) Determine the impulse response of a filter matched to s(t)

ii) Plot the matched filter output as a function of time

iii) Determine the peak value of the output.

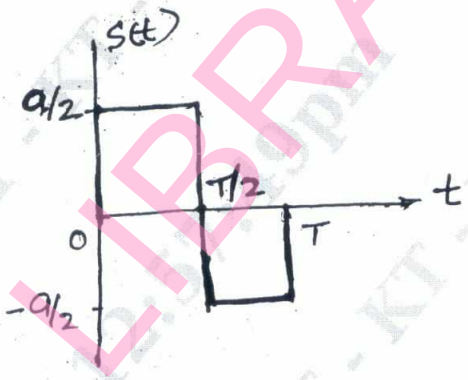

Fig Q7(c) **(06 Marks)**

8 a. Explain fast frequency hop spread spectrum system. **(10 Marks)**

b. The DSSS spread spectrum has following parameters. Data sequence bit duration $T_b = 4.095\text{ms}$ PN chip duration, $T_c = 1\mu\text{s}$, $\frac{E_b}{N_o} = 10$ for average probability of error $< 10^{-5}$.

Calculate processing gain and jamming margin. **(06 Marks)**

c. Explain applications of spread spectrum modulation technique. **(04 Marks)**

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10EC/TE62

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Microprocessors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Trace the development of intel 86 family of microprocessors briefly indicating the additional features introduced at each stage of development from 8086 to Pentiun IV. **(10 Marks)**

b. Explain the functions of the following registers in 8086 CPU:
i) The segment registers ii) The instruction queue iii) The flag register. **(10 Marks)**

2 a. Explain the (MOD-REG-R/M) byte of an 8086 instruction, with its interpretations. **(04 Marks)**

b. What do the following instructors do?
i) ROL ii) RCL iii) STD iv) XCHG AX, [BX]. **(08 Marks)**

c. What are assembler directives? Explain the significance of the following: i) Assume ii) EXTRN iii) PUBLIC. **(08 Marks)**

3 a. What are string instructions? How do they help in reducing the number of instructions used in a program? **(10 Marks)**

b. Distinguish between MACRO and procedure. **(04 Marks)**

c. Write an algorithm and a program to convert the given four digit BCD data to its equivalent hexadecimal value. **(06 Marks)**

4 a. Explain the interrupt structure in 8086. Write the functions of at least five dedicated software interrupts in 8086. **(10 Marks)**

b. With a note on the interrupt instructions in 8086 **(05 Marks)**

c. Describe the action taken by 8086 when NmI pin is activated. **(05 Marks)**

PART – B

5 a. With relevant interface diagram, write a flow chart and program code for 4 × 4 matrix keyboard detect, debounce and encode procedure. **(10 Marks)**

b. Explain how to interface stepper motor to an 8086 processor. **(10 Marks)**

6 a. Explain with a neat block diagram the architecture of arithmetic processor 8087. **(10 Marks)**

b. Write a program to compute the volume of a sphere using 8087 instructions (Use formula $V = 2\pi R^3/3$). **(10 Marks)**

7 a. With appropriate circuit diagrams, explain how you would generate, data, address and control buses for memory and I/O interfacing from an 8086 processor in the MAX mode of operation. **(10 Marks)**

b. Explain the features of USB and LPT interface. **(10 Marks)**

8 a. Describe the basic 486 architecture. **(05 Marks)**

b. List the extended resistors found in 80386 microprocessor. **(06 Marks)**

c. What are the unique features of a Pentium processor? **(09 Marks)**

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10EC63

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Microelectronics Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Draw the physical structure and hence explain the operation of NMOS enhancement type transistor. **(06 Marks)**

b. Derive the expression for drain current i_D in triode and saturation region. **(06 Marks)**

c. Consider a CMOS process for which $L_{min} = 0.8\ \mu m$, $t_{ox} = 15$ nm, $\mu_n = 550\ cm^2/V\text{-}s$ and $V_t = 0.7$ V.

(i) Find C_{ox} and K_n'

(ii) For an NMOS transistor with $\frac{W}{L} = \frac{16\ \mu m}{8\ \mu m}$, calculate the values of V_{OV}, V_{GS} and V_{DSmin} needed to operate the transistor in the saturation region with a DC current $I_D = 100\ \mu A$.

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

2 a. The NMOS and PMOS transistors in the circuit of Fig.Q2(a) are matched with $K_n'\left(\frac{W_n}{L_n}\right) = K_p'\left(\frac{W_p}{L_p}\right) = 1\ mA/V^2$ and $V_{tn} = -V_{tp} = 1V$. Assuming $\lambda = 0$ for both devices, find the drain currents i_{DN} and i_{DP} and the voltage V_0 for $V_I = 0$ V, +2.5 V, – 2.5V.

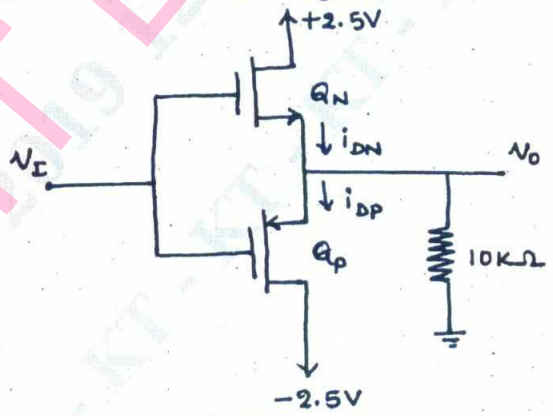

Fig.Q2(a) **(06 Marks)**

b. Draw the circuit diagram of source follower amplifier. Draw its small signal equivalent circuit with r_0. Obtain the expression for V_0, A_V, A_{Vo}, G_V and R_{out}. **(10 Marks)**

c. State and prove Miller's theorem. **(04 Marks)**

3 a. Draw the MOSFET constant current source circuit and explain its operation. **(04 Marks)**

b. Given $V_{DD} = 3V$ and using $I_{REF} = 100\ \mu A$, it is required to design MOSFET constant current source shown in Fig.Q3(b) to obtain an output current whose nominal value is 100 μA. Find R if Q_1 and Q_2 are matched and have channel lengths of 1 μm, channel widths of 10 μm, $V_t = 0.7V$, and $K_n' = 200\ \mu A/V^2$. What is the lowest possible value of V_0? Assuming that for this process technology the early voltage $V_A' = 20\ V/\mu m$, find the output resistance of the current source. Also, find the change in output current resulting from a +1V change in V_o

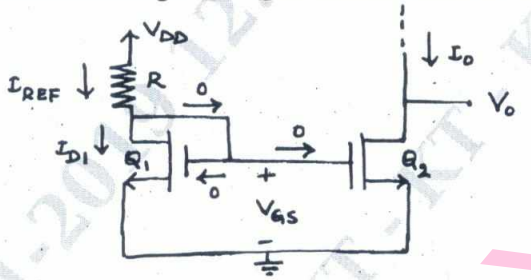

Fig.Q3(b) **(08 Marks)**

c. Explain the operation of a MOS current steering circuit and mention its advantages. **(08 Marks)**

4 a. A CMOS common source amplifier shown in Fig.Q4(a) is fabricated in a 0.18 μm technology has $\frac{W}{L} = \frac{7.2\ \mu m}{0.36\ \mu m}$ for all transistors, $K_n' = 387\ \mu A/V^2$, $K_p' = 86\ \mu A/V^2$, $I_{REF} = 100\ \mu A$, $V_{An}' = 5\ V/\mu m$ and $|V_{Ap}| = 6\ V/\mu m$. g_{m_1}, r_{01}, r_{02} and the voltage gain.

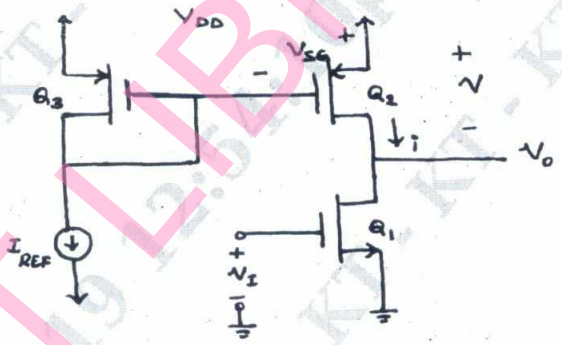

Fig.Q4(a) **(10 Marks)**

b. For the high frequency equivalent circuit for a common source MOSFET amplifier shown in Fig.Q4(b). Derive an expression for 3-dB frequency, f_H using Miller's theorem and open circuit time constant. **(10 Marks)**

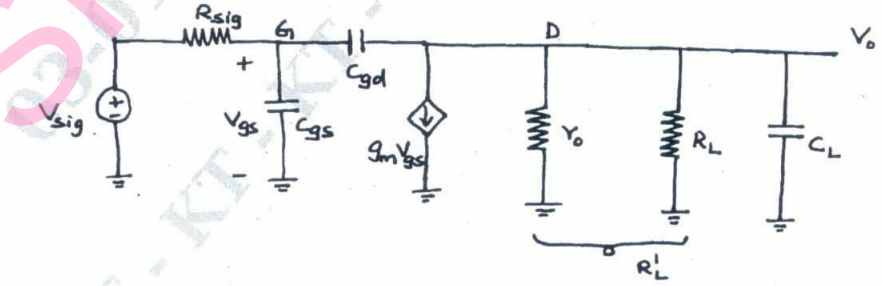

Fig.Q4(b)

5 a. Explain the operation of MOS differential pair with a common mode input voltage. **(04 Marks)**

b. A MOS differential pair is operated at a total bias current of 0.8 mA, using transistors with a W/L ratio of 100, $\mu_n C_{ox} = 0.2$ mA/V^2, $V_A = 20$V, and $R_D = 5$ kΩ. Find V_{OV}, g_m, r_o and A_d. **(08 Marks)**

c. With a neat circuit diagram, explain the operation of two stage CMOS operational amplifier configuration. **(08 Marks)**

PART – B

6 a. What are the properties of negative feedback? Explain in more detail. **(06 Marks)**

b. Explain the effect of feedback on the amplifier poles. **(06 Marks)**

c. Discuss the method of frequency compensation for modifying open-loop gain A(s) so that the closed loop amplifier is stable, by introducing a new pole in transfer function at sufficiently low frequency. **(08 Marks)**

7 a. Design an inverting op-amp circuit to form the weighted sum V_0 of two inputs V_1 and V_2. It is required that $V_0 = -(V_1 + 5V_2)$. Choose values for R_1, R_2 and R_f so that for a maximum output of 10 V the current in the feedback resistor will not exceed 1 mA. **(04 Marks)**

b. Explain in detail dc imperfections of an operational amplifier. **(06 Marks)**

c. An op-amp wired in the inverting configuration with the input grounded, having $R_2 = 100$kΩ and $R_1 = 1$ kΩ has an output DC voltage of – 0.3V. If the input bias current is known to be very small, find the input offset voltage. **(04 Marks)**

d. Explain how to minimize the temperature effect in a logarithmic amplifier. **(06 Marks)**

8 a. Explain in detail the static and dynamic operation of a CMOS inverter. **(08 Marks)**

b. Sketch a CMOS realization for the function

$$Y = \overline{A + B(C + D)}$$ **(04 Marks)**

c. Provide transistor $\frac{W}{L}$ ratios for the logic circuit shown in Fig.Q8(c). Assume that for the basic inverter n = 1.5 and p = 5 and that the channel length is 0.25 μm. **(08 Marks)**

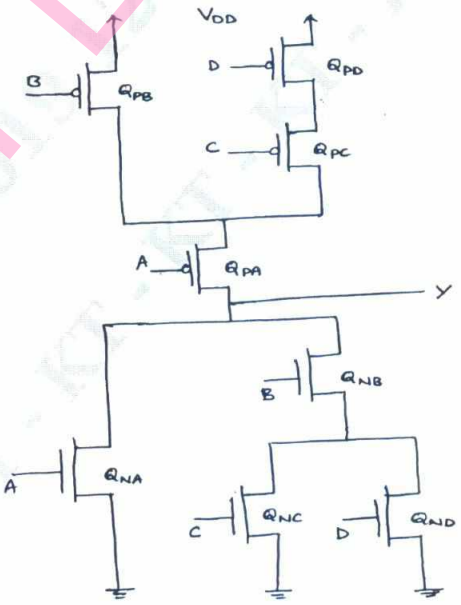

Fig.Q8(c)

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10EC64

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Antenna and Propagation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following terms related to antenna.
(i) Radiation intensity
(ii) Directivity
(iii) Antenna field zones
(iv) Half power Beam width (HPBW) **(12 Marks)**

b. The radiation intensity of an antenna is given by $u(\theta, \phi) = \cos^4\theta \sin^2\phi$ for $0 \le \theta \le \frac{\pi}{2}$ and $0 \le \phi \le \pi$, it is zero in the lower half space. Find :
(i) Exact directivity dB
(ii) Elevation half power B.W in degrees. **(08 Marks)**

2 a. Explain power theorem and its application to an isotropic antenna. **(05 Marks)**
b. Find the directivity of an unidirectional Cosine pattern and also show that the directivity for unidirectional operation is $2(n + 1)$ for an intensity variation of $U = U_m \cos^n\theta$. **(07 Marks)**
c. Find the field pattern of an end fire array of 2 isotropic point source. **(08 Marks)**

3 a. Show that the maximum effective aperture of a $\frac{\lambda}{2}$ dipole is $A_{e_m} = 0.13\lambda^2$ and find its directivity. **(10 Marks)**
b. Consider a 200KHz radio transmitter feeding a 100m vertically oriented antenna. Determine its effective, height, radiation resistance radiation efficiency, Given loss resistance of the antenna R_L is 1.5Ω. **(05 Marks)**
c. A parabolic dish has diameter d = 20m and $\eta = 0.55$. The operating frequency is 5GHz compute its gain and beam width between first nulls. **(05 Marks)**

4 a. Derive the expression for Radiation Resistance of Large Loop Antennas. **(10 Marks)**
b. A loop antenna has $A = 1m^2$ and N = 10 turns. The coil wire has R = 10 Ω and L = 0.5mH. It is turned by a variable capacitor to resonate with a wave of $141.4 \sin 6\pi \times 10^5 t$ μv/m. Determine the voltage developed across the capacitor when the loop is oriented at 45°. **(10 Marks)**

PART – B

5 a. Describe Helical Antenna with two modes of operation. **(08 Marks)**
b. Give a brief comparison between the parabolic reflector and corner reflector. **(08 Marks)**
c. Write a note an plasma antenna. **(04 Marks)**

6 a. Write the diagram and explain the operation of Yagi-Uda antenna with design parameter. (08 Marks)

b. Determine the cut-off and bandpass frequencies of a log periodic array with a design factor of 0.7. Ten dipoles are used in the structure, the least dipole having a dimension of 0.6m. (08 Marks)

c. Write a note on Antennas on mobile Handsets. (04 Marks)

7 a. Derive an expression for space wave field intensity from the earth surface. (10 Marks)

b. Explain the propagation of radio waves through different regions and also discuss the three factors which affect the propagation. (10 Marks)

8 a. Define the following terms related to ionospheric propagation:
   i) Critical frequency
   ii) Virtual height
   iii) Skip distance. (09 Marks)

b. Write a note on Troposcopic scattering. (06 Marks)

c. Derive an expression for maximum usable frequency. (05 Marks)

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10EC65

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operating Systems

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain operations and task performed by operating system. **(06 Marks)**
b. Explain with diagram resource allocations methods. **(06 Marks)**
c. List the classes of operating systems and explain time sharing operating system with diagram. **(08 Marks)**

2 a. Explain real time operating system with examples of real time applications **(06 Marks)**
b. Explain with diagram Microkernel based operating system **(08 Marks)**
c. Explain structure of a supervisor. **(06 Marks)**

3 a. Describe the component of process environment. **(06 Marks)**
b. Explain with diagram kernel level thread implementation. **(06 Marks)**
c. Explain fundamental state transition diagram for a process with process control block. **(08 Marks)**

4 a. Explain contiguous and non contiguous memory allocation. **(06 Marks)**
b. Explain first fit and best fit techniques with examples. **(08 Marks)**
c. Explain memory compaction and memory fragmentation. **(06 Marks)**

PART – B

5 a. Find the number of page fault for following page reference string using FIFO and LRU page replacement policies. Assume there are three page frames for allocation and first three pages accounts for page fault.
Reference string : 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5. **(08 Marks)**
b. Explain with diagram demand paging. **(08 Marks)**
c. Explain page sharing. **(04 Marks)**

6 a. Explain facilities provided by file system and IOCS layers. **(08 Marks)**
b. Describe operations performed on files. **(06 Marks)**
c. Write note on UNIX file system. **(06 Marks)**

7 a. Explain with block diagram event handling and scheduling. **(08 Marks)**
b. Describe mechanism and policy modules of process scheduler. **(06 Marks)**
c. Consider four processes P1, P2, P3, and P4 with burst time 3m sec, 6m sec, 4m sec and 2m sec enters scheduler in order P1, P2, P3, P4. Calculate waiting time, average waiting time, turnaround time and average turnaround time using FCFS scheduling method. assume all process arrive at '0' m sec. **(06 Marks)**

8 a. Explain direct and indirect naming. **(06 Marks)**
b. Explain with diagram inter-process message control box. **(06 Marks)**
c. Explain mail box and its applications. **(08 Marks)**

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10EC662

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Satellite Communication

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Describe the characteristics of the domestic satellites which provides a DTH television services. **(08 Marks)**

b. With neat sketch, explain the principle of operation and its features of polar orbiting satellites and its applications. **(07 Marks)**

c. Explain the services offered by INTELSATs. **(05 Marks)**

2 a. State Kepplers 3 laws of planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the earth. **(08 Marks)**

b. What are the conditions to be satisfied for an orbit to be geo stationary and the information needed to determine the look angles for a geo stationary orbit. **(07 Marks)**

c. A geo stationary satellite is located at 85°W, calculate the azimuth angle for an ES antenna at lat 30°N and long 98°W. Calculate elevation angle, sketch the azimuth angle related to the angle A. **(05 Marks)**

3 a. Calculate for a free of 12 GHz, el = 22° for the horizontal polarization used for the rain rate $R_{0.01}$ = 15mm/h, h_0 = 600m and h_R = 1500m. Calculate the rain attenuation. Give a_h = 0.0188 and b_h = 1.217. **(05 Marks)**

b. Derive a suitable expression for $[CNR]_U$ and $[CNR]_D$ for a link budget calculation. **(07 Marks)**

c. Discuss various space link design transmission losses. **(08 Marks)**

4 a. Briefly describe various units of transponder for a C band communication satellite, construct a wide band receiver. Discuss how the capacity of a transponder can be increased. **(08 Marks)**

b. Describe various methods used for attitude control. **(06 Marks)**

c. With neat block diagram explain the role of TT and C. **(06 Marks)**

PART – B

5 a. Explain the role of indoor and outdoor unit in earth segment with neat block diagram explain the home terminal for DBS TV/FM reception. **(10 Marks)**

b. With neat sketches explain the basic blocks of transmit receive earth station. **(10 Marks)**

6 a. EIRP from Sat_1= is 30 dBW, G_R is 44 dB in desired direction and 25.67dB towards interfering satellite. The interfering satellite also radiates an EIRP of 34dBW. The polarization discrimination is 4dB. EIRP from ES is 24 dBW, ANT gain is 55dB and neigbhour sat. txit at 30 dBW. The off axis gain in the S_{at_1} direction is 25.67 dB. Polarization discrimination is 4 dB. Calculate $\left[\frac{C}{I}\right]_{ant}$. **(04 Marks)**

b. Illustrate basic TDMA concept. Explain the basic equipment block of TDMA and frame and burst formats for a TDMA system. **(08 Marks)**

c. With neat sketch, explain the principle of operation of channel assignment of a transponder and its traffic for a preassigned FDMA system. **(08 Marks)**

7 a. Explain the frequency planning, polarization and transponder capacity for DBS TV? **(10 Marks)**

b. Describe briefly VSAT and satellite mobile services. **(10 Marks)**

8 Write short notes on :

a. Sat switched TDMA

b. ANT sub system

c. IRRIDIUM

d. GPS. **(20 Marks)**

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10EC665

Sixth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Programming in C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is object oriented programming? Explain any four basic concepts of OOPS. **(10 Marks)**

b. What is data type? Explain the different data types supported in C++. **(10 Marks)**

2 a. Explain with an example the relationship between arrays and pointer types. **(06 Marks)**

b. What is meant by enumerated data type? Explain with an example. **(04 Marks)**

c. With a C++ program explain the usage of 'new' and 'delete' operators for dynamically allocating memory. **(10 Marks)**

3 a. Describe with examples the following control structures in C++:
(i) Do while loop (ii) if else (iii) for loop. **(10 Marks)**

b. Evaluate the expressions: (i) $5+8<14-2\|\|16>3$ (ii) $6+7>=12\ \&\ \&(3+4)>2*4$. **(04 Marks)**

c. Write a C++ program to accept a character and categorize it as an alphabet or a digit or a special symbol using 'switch' case statement. **(06 Marks)**

4 a. Explain with suitable examples: (i) Pass by value and (ii) pass by pointer, mechanisms of passing arguments in functions. **(10 Marks)**

b. Write a C++ program to find the factorial of numbers using recursive function. **(06 Marks)**

c. With an code snippet illustrate the application of in-line function in C++ language. **(04 Marks)**

PART – B

5 a. Explain with a simple C++ program the try_catch throw mechanism of handling exceptions. **(10 Marks)**

b. Discuss the design issues associated with the use of exception handling in C++. **(10 Marks)**

6 a. Define constructor and types for a given class, with an example C++ program. **(10 Marks)**

b. Write a C++ program to perform stack operations like push and pop. **(10 Marks)**

7 a. Define operator overloading. Write a C++ program to concatenate two strings by overloading operator +. String S_1 = VTU, S_2 = BELAGAVI. Store the result in string S3. **(10 Marks)**

b. Write a C++ program to overload operators. **(10 Marks)**

8 a. Explain single and multi-level inheritance with example programs. **(10 Marks)**

b. Explain the difference between:
(i) Protected inheritance.
(ii) Private inheritance. **(10 Marks)**

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