18/5/2022(E)

SOMAIYA
VIDYAVIHAR UNIVERSITY

Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**	**Duration: 3hr**
Programme code: 03 **Programme: B. Tech Electronics and Telecommunication Engineering**	**Class:** SY	**Semester:IV(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:** EXTC	
Course Code: 116U03C401	**Name of the Course: Mathematics for Communication Engineering –II**	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1	**Attempt any TWO questions out of the following.**	14
i)	Express $p(x) = 6 + 11x + 6x^2$, as a linear combination of the following $p_1 = 2 + x + 4x^2, p_2 = 1 - x + 3x^2$, $p_3 = 3 + 2x + 5x^2$	
ii)	Construct an orthonormal basis of R^3 applying Gram –Schmidt process to $S = \{(3,0,4), (-1,0,7), (2,9,11)\}$	
iii)	Show that $S = \{(3,1,1), (2,0,-1), (4,2,1)\}$ is linearly independent.	
Q2 A	Evaluate $\oint_C \frac{z+3}{z^2-2z+5}$, where C is $\|z - 1\| = 1$	4
Q2 B	**Attempt any THREE questions out of the following.**	21
i)	Evaluate $\int_C \frac{z+3}{2z^2+3z-2} dz$, Where C is circle (i) $\|z\| = 1/4$ (ii) $\|z - i\| = 2$	
ii)	Find Laurent's series which represents the function $f(z) = \frac{4z+3}{z(z+2)(z-3)}$ when $2 < \|z\| < 3$	
iii)	Using residue theorem evaluate $\int_0^{\pi} \frac{1}{3+2\cos\theta} d\theta$,	
iv)	Evaluate $\int_0^{1+i} (x^2 + iy)dz$, along the path $y = x^2$.	
v)	Using residue theorem evaluate $\int_C \frac{z^2}{(z-1)^2(z-2)} dz$, where C is $\|z\| = 2.5$	

Q3 A	Attempt any TWO questions out of the following.	8
i)	If $\sum(x-\bar{x})^2 = 136$, $\sum(y-\bar{y})^2 = 138$, $\sum(x-\bar{x})(y-\bar{y}) = 122$ Find correlation coefficients between x *and* y.	
ii)	If X is normal variate with mean 120 and standard deviation 10. Find the C such that $P(X < C) = 0.02$.	
iii)	The Probability density function of a random Variables x is represented by the following $f(x) = K(1+x)$, $2 \le x \ge 5$ Find K and expection of x	
Q3 B	Attempt any FOUR questions out of the following.	28
i)	Find the coefficient of Rank correlation for the following data (table below)	
ii)	The Marks obtained in mathematics by 1000 students is normally distributed with mean 70 and Standard deviation 5. I) Determine how many students got marks between 60 and 75 II) What was the highest mark obtained by the lowest 10 % of students?	
iii)	A random variable X has the following probability distrubutaion (table below) (i) Find the constant k. (ii) Find mean & Variance (iii) Find c.d.f. of random variable X (iv) Find $p(2 < x \le 6)$	
iv)	Find the M.G.F of the following distribution (table below) Find first four moments about the origin.	
v)	Find the equations of line of regression y on x for the following data (table below) also find y for x=15.	

Q3 B i)

X	32	55	49	60	43	37	43	49	10	20
Y	40	30	70	20	30	50	72	60	45	25

Q3 B iii)

X	1	2	3	4	5	6	7
p(x)	k	2k	3k	k^2	k^2+k	$2k^2$	$4k^2$

Q3 B iv)

X	0	1	2
$P(X=x)$	1/3	1/3	1/3

Q3 B v)

x	5	6	7	8	9	10	11
y	11	14	14	15	12	17	16

Q4 A	Find all basic solutions to the below problem. Which of them basic feasible solutions, non-degenerate, infeasible basic and optimal basic feasible solutions? maximise $z = x_1 + x_2 + 3x_3$ Subject to $x_1 + 2x_2 + 3x_3 = 9$ $3x_1 + 2x_2 + 2x_3 = 15$ Where $x_1, x_2, x_3 \geq 0$ OR Convert the following L.P.P in the standard form. Minimise $z = -3x_1 + 2x_2 + x_3$ Subject to $x_1 - 3x_2 + 2x_3 < 13$ $-4x_1 + 2x_2 + x_3 > 15$ $2x_1 - x_3 = -1$ Where $x_1, x_2 \geq 0$	4
Q4 B	**Attempt any THREE questions out of the following.**	21
i)	Solve the following L.P.P. by Simplex method Maximise $z = 6x_1 - 2x_2 + 3x_3$ Subject to $2x_1 - x_2 + 2x_3 \leq 2$ $x_1 + 4x_3 \leq 4$ Where $x_1, x_2, x_3 \geq 0$	
ii)	Using Penalty (Big M) method solve the following LPP Minimise $z = 2x_1 + 3x_2$ Subject to $x_1 + x_2 \geq 5$ $x_1 + 2x_2 \geq 6$ $x_1, x_2 \geq 0$	
iii)	Using the method of Lagrange's Multiplier solve the following N.L.P.P. Optimize $z = 10x_1 + 8x_2 + 6x_3 + 2x_1^2 + x_2^2 + 3x_3^2 - 100$ Subject to $x_1 + x_2 + x_3 = 20$ where $x_1, x_2, x_3 \geq 0$	
iv)	Using the Kuhn-Tucker conditions, solve the following N.L.P.P. Maximise $z = -x_1^2 - x_2^2 + 8x_1 + 10x_2$ Subject to $3x_1 + 2x_2 \leq 6$ where $x_1, x_2 \geq 0$	

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Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**		
Programme code:0~~3~~64 Honours in Adv. & Tel.			**Duration:3 hrs**
Programme:Electronics and Communication Enginnering		**Class:** SY	**Semester:**IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		**Name of the department:** EXTC	
Course Code: 116H64C401	**Name of the Course:** Broadband Communication		
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary			

Question No.		Max. Marks
Q1 (a)	List some strategies in Reservation Techniques(Polling) and Random Access Techniques which are used to avoid collision. Or List out issues in broadband network.	10
Q1 (b)	i. Distinguish between communication at the network layer and communication at the data-link layer. ii. Distinguish between S-Aloha and Aloha(Reservation)	10
Q2 (a)	Answer (Any Two) i. What are the four general techniques to improve the quality of service? ii. Explain the architecture of B-ISDN iii. Explain various channel in ISDN. iv. List down the applications of storage area network	10
Q2 (b)	How are X 25 and frame relay different? State the advantages and disadvantages of X.25.	10
Q3 (a)	What is difference between datagram and packet? Explain the concept of Virtual Circuit switched networks	10
Q3 (b)	Distinguish between synchronous TDM and Statistical TDM Or, List four major components of a packet switch and their functions. Why does a datagram network need only end-to-end addressing during the data transfer phase, but no addressing during the setup and teardown phases?	10
Q4 (a)	Illustrate and explain architecture of ATM protocol. Discuss the features of ATM networks.	10
Q4 (b)	Describe the ATM AAL layer protocols. What is the relationship between TPs, VPs, and VCs? Or, How does an NNI differ from a UNI? Some of the congestion-control schemes	10

	are inadequate for ATM Networks. Why?	
Q5 (a)	Compare Ethernet PON, Gigabit PON,WDM PON How does SDH relate to SONET?	10
Q5 (b)	Name the different components of SONET. Describe their various functions. What is the major advantage of SDH?	10

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Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**		**Duration: 3hrs**
Programme code: 63 **Programme:** Honors Programme in Networking		**Class:** SY	**Semester:** IV **(SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**		**Name of the department:** EXTC	
Course Code: 116h63C401	**Name of the Course: Networks and Applications**		
Instructions: 1) Draw neat diagrams 2) Assume suitable data if necessary			

Question No.		**Max. Marks**
Q1	Attempt any four: a) Explain what is MAC Table and Routing table and how it is populated? b) List the multiplexing techniques used in optical communication and explain any one in brief. c) Explain Cell sectoring in brief and discuss the issue related to cell sectoring d) List the rules for shortening the IPv6 address and shortened the following IPv6 address: i. FE80:0000:0000: 0000:0002:0000:0000: FBE8 ii. 2001:0DB8:0000:0000: 0000:0000:0000:1000 iii. 2001:0DB8:8B00: 1000:0002:0BC0:0D07:0099 e) Explain the ways in which power efficiency in WSN can be accomplished f) List the characteristics of WAN	20
Q2 (a)	The following part of a TCP header dump (contents) in hexadecimal format **E293 0017 00000001 00000000 5002 07FF** Answer the following questions i. What is the source port number? ii. What is the sequence number? iii. What is the length of the header? iv. What is the window size? v. What is the type of the segment? A company is granted the site address 201.70.64.0 (class C). The company needs six subnets. Design the subnets	10
Q2 (b)	i. Compare the various wired transmission media ii. Compare IPv4 and IPv6 OR Explain the architecture of electronic mail and also mention the protocols used.	10
Q3 (a)	Explain the principle of operation of Optical Couplers OR With the help of diagram explain WPON	10

Q3 (b)	i. With the help of diagram explain the layered view of second-generation optical network ii. Describe in short, the classification of access network	10
Q4 (a)	Compare Category1 WSN and Category 2 WSN	10
Q4 (b)	i. With the help of the diagram explain the hardware components in sensor node technology. ii. List the various routing protocols utilized in WSN and draw the WSN protocol stack. OR Draw the components of a typical sensing node and categorize the issues related to Sensors and their Communication/Computing Architecture.	10
Q5 (a)	i. Compare the first and second-generation handoff strategies ii. Describe with the help of diagram the various interfaces used in GSM. OR Describe the features of IS-95 and specify the forward link specification	10
Q5 (b)	List the GSM Radiosubsystem Specifications and the functionality of HLR, VLR, AUC and OSS.	10

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27/05/2022(E)

Maximum Marks: 100	Semester: January 2022 – May 2022 Examination: ESE Examination	Duration:3Hrs
Programme code: 03 Programme: B.Tech Electronics and Telecommunication Engineering	Class: SY	Semester: IV (SVU 2020)
Name of the Constituent College: K. J. Somaiya College of Engineering		Name of the department: EXTC
Course Code: 116U03C405	Name of the Course: Electromagnetic Field Theory	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a) (i)	Point charge Q1=300μC located at (1,-1,-3) m experiences a force of **F1**= (8**ax** -8**ay** + 4**az**) N due to point charge Q2 located at (3,-3,-2) m. Calculate Q2. **OR** Find the flux density at a point A (0,3,4) m due to: 1) A point charge Q of 0.5μC at the origin. 2) A uniform charge density $\rho_s = 40\ \mu C/m^2$ at a plane z = 8m	05
Q1(a) (ii)	For x, y and z positive, if ρ_v = 50xyz C/m^3, find the total charge within the region defined by $0\leq x, y, z\leq 2$m **OR** Derive equation for Electric field due to infinite line charge.	05
Q1 (b)	Given the potential V = $(2x^2y-5z)$ Volts. Find V, E,D and ρ_v at a given point P (-2,1,5)m	10
Q2 (a) (i)	A current filament of 10A in **ay** direction is parallel to y axis at x=2m, z = -2 m. Find magnetic field intensity H at the origin. **OR** Using Biot-Savart's law, find d**H** at the origin due to a current element Idl = 3π (ax+2ay+3az) A.m at the point P(3,4,5)m in the free space.	05
Q2(a) (ii)	Find the flux crossing the plane surface defined by $0.5\leq r\leq 2.5$m and $0 \leq z\leq 2.0$ m if **B**= (20/r) a**φ** Tesla.	05
Q2 (b)	Write short notes on: (Any two) 1. Lorenz Force equation and its applications 2. Boundary conditions on H and B 3. Magnetic materials 4. Ampere's circuit law with proof	10
Q3 (a)	Given **E**= 10 sin (ωt-βz) **ay** V/m in free space. Determine D, B and H.	10

Q3 (b)(i)	If the electric field strength of a radio broadcast signal at a TV receiver is given by **E** = 5cos(ωt-βy) **az** V/m existing in a medium whose conductivity is given by $2x10^3$ mho/cm. Find displacement and conduction current densities.	05
Q3 (b)(ii)	List Maxwell's equations in both integral and differential form. **OR** Explain significance of Maxwell's equations.	05
Q4 (a)	A medium like copper conductor which is characterized by the parameters $\sigma = 5.8x10^7$ mho/m, $\epsilon_r = 1$, $\mu_r = 1$supports a uniform plane wave of frequency 60Hz. Find 1) attenuation constant 2) propagation constant 3) intrinsic impedance 4) wavelength 5) phase velocity of the wave.	10
Q4 (b)	Explain ANY TWO of following: 1. Poynting Vector 2. Depth of penetration 3. Propagation characteristics of EM waves in free space	10
Q5 (a)	A perpendicularly polarized wave is incident at an angle of $\theta i = 15^0$. It is propagating from medium 1 to medium 2. Medium 1 is defined by $\epsilon_{r1} = 8.5$, $\mu_{r1} = 1$, $\sigma 1 = 0$ and medium 2 is free space. If Ei = 1 mV/m, determine Er, Hi, Hr.	10
Q5 (b)	Write short notes on any TWO of the following: 1. Ink-jet printer 2. Waveguides 3. Biological effects of EM waves	10

23|05|2022 (E)

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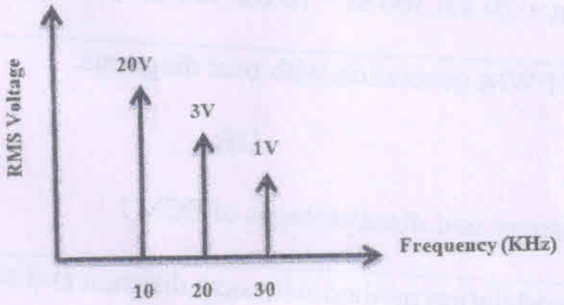
Maximum Marks: 100	Semester: January 2022 – May 2022 Examination: ESE Examination	Duration:3 Hrs
Programme code:03 Programme: B.Tech Electronics and Telecommunication Engineering	Class: SY	Semester: IV(SVU2020)
Name of the Constituent College: K. J. Somaiya College of Engineering	Name of the department: EXTC	
Course Code: 116U03C403	Name of the Course: Communication Systems	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)(i)	A 400 W carrier is modulated to a depth of 75%. Find : 1)The total power in the amplitude - modulated wave 2)Power in lower and upper side bands **OR** Derive amount of power wasted in DSBFC considering 100% modulation.	05
Q1 (a)(ii)	One input to a conventional AM modulator is 500 KHz carrier with amplitude of 20VP. The second input is a 10 KHz modulating signal that is of sufficient amplitude to cause a change in the output wave of ±7.5VP. Determine A. Upper and lower side frequencies B. Modulation coefficient and percent modulation C. Peak amplitude of the modulated carrier and the upper and lower side frequency voltages D. Expression for the modulated wave.	05
Q1 (b)	Explain Armstrong method of FM generation using suitable neat and diagrams.	10
Q2 (a)(i)	What is correlated noise? Give its type. Determine percentage total harmonic distortion for the figure given below if fundamental frequency is 10KHz.  	05
Q2 (a)(ii)	A radio receiver with 10kHz bandwidth has noise figure of 30dB. Determine the signal power required at the input of receiver to achieve input SNR of 30dB.	05

Q2 (b)	Explain working of Ring modulator circuit with neat diagrams and necessary waveforms. **OR** Draw the block diagram of filter method of SSB generation and explain. Why is this method requiring multiple oscillators to convert signal to high frequency?	10
Q3 (a)	A FM wave is represented by the following equation, $V = 10 \sin [5 \times 10^8 t + 4 \sin 1250 t]$ Find: 1. Carrier and modulating frequencies 2. Carrier amplitude 3. Modulation index and maximum deviation 4. Power dissipated by this FM wave in a 50 ohm resistor 5. If Em= 2 Volts, find frequency sensitivity kf	10
Q3 (b)	Write short notes on (any two) 1. Frequency spectrum of FM wave 2. Noise triangle 3. Selection of I.F. frequency 4. Delayed AGC	10
Q4 (a)	Explain Double spotting problem faced in receivers. If fs = 800 kHz, IF = 455kHz, calculate image frequency and discuss this problem of double spotting in above given case. **OR** A SHR is tuned to 3MHz - 30 MHz and I.F. frequency is 40.525MHz and if the bandwidth= 10kHz. Find: 1. Range of local oscillator frequency 2. Range of image frequency	10
Q4 (b)	1. Draw waveforms for FM and PM 2. How PM can be obtained from FM?	05 05
Q5 (a)(i)	Determine the Nyquist rate for following continuous-time signal $x(t) = 6 \cos 50 \pi t + 20 \sin 300 \pi t - 10 \cos 100 \pi t$	05
Q5 (a)(ii)	Explain in brief PWM generation with neat diagrams. **OR** What are advantages and disadvantages of PCM?	05
Q5 (b)	Explain delta modulation method with neat diagram and suitable example. OR	10

Explain PAM generation with neat diagrams.

25/5/2022(E)

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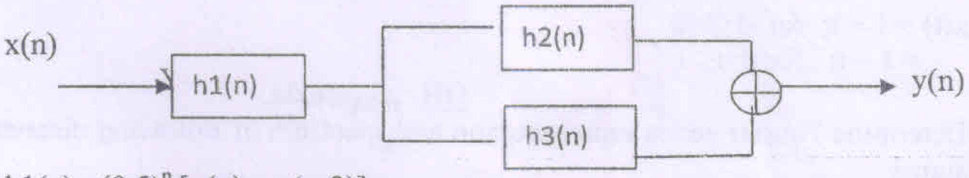
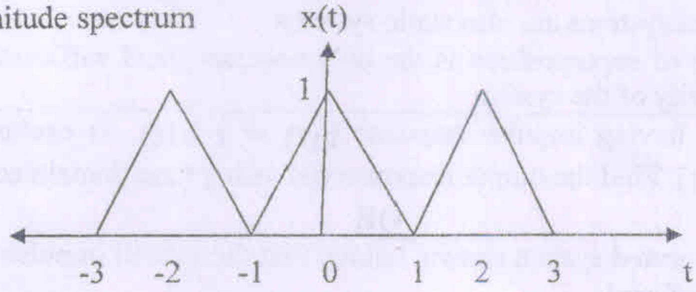
Maximum Marks: 100	**Semester: January 2022 – May 2022** **Examination: ESE Examination**	**Duration:3 Hours**
Programme code: 03 **Programme: BTech EXTC**	**Class:** ~~FY~~/SY/~~TY~~/~~LY~~	**Semester: IV (SVU 2020)**
Name of the Constituent College: **K. J. Somaiya College of Engineering**	**Name of the department:** EXTC	
Course Code: **116U03C404**	**Name of the Course: Signals and Systems**	
Instructions: 1)Draw neat diagrams 2)Assume suitable data if necessary		

Question No.		Max. Marks
Q1 (a)	Determine whether following signals are Energy or power signal. Calculate their energy or power. i) **$x(t) = u(t)-u(t-3)$** ii) **$x[n] = 3\,(0.5)^n\,u[n]$**	05
Q1 (b)	The signal $x(t)= 2\cos(20\pi t) + \sin(40\pi t)$ is sampled at 75 Hz to get sampled signal x[n]. i) Check if x(t) is periodic. ii) Write expression for x[n] iii) What is the common period of the sampled signal x[n]	05
Q1(c)	**If y[n]=[1 ,-2, 0,4,6,-4,1]** where origin position is shown by ⇑ sketch i) y[n+2] ii) Odd and Even parts of y[n] iii) y[-n-1] iv) y[n]+[u[n+2]-u[n-2]]	10
Q2 (a)	Classify following system as static / dynamic, causal / anticausal , linear / nonlinear and time variant / invariant. Justify your answers. **$y[n] + 2y[n-1] = x[n]$**	06
Q2 (b)	State whether following statements are True or false and Justify your answer with example. i) All causal systems are also static systems. ii) Principle of superposition is the only necessary and sufficient condition for linearity of the system	04
Q2 (c)	A LTI system having impulse response **$h(t) = t\,u(t)$** is excited by input **$x(t) = e^{-5t}\,u(t)$**. Find the output response y(t) using time domain convolution **OR** For the interconnected system shown below, find the overall impulse response (Do not use Transform)  $h1(n)= (0.5)^n\,[u(n) - u(n-3)]$ $h2(n)=u(n-1)$ and $h3(n)= \delta(n)$	10

<table>
<tr><td>Q3 (a)</td><td>Find Z transform and mention ROC for following DT signals
i) $x(n) = [-1, 0, 5, \underset{\Uparrow}{2}, -1, 5, 4,]$
ii) $x(n) = (0.3)^n u[n] + (0.9)^n u[-n-1]$
iii) $x(n) = n(a)^n u(n)$ where $(a < 1)$</td><td>10</td></tr>
<tr><td>Q3 (b)</td><td>Find Inverse Z transform for all possible ROC conditions for
$X(Z) = \dfrac{Z(3Z-4)}{(Z-0.5)(Z-3)}$
Comment on stability and causality in each case.
OR
A DT system is described by $y(n)-2y(n-1)-3y(n-2)=x(n-1)$
i) Determine transfer function of the system
ii) Determine impulse response
iii) Draw pole zero plot and comment on stability</td><td>10</td></tr>
<tr><td>Q4 (a)</td><td>The current in a circuit is governed by second order differential equation
$\dfrac{d^2 i(t)}{dt^2} - 3\dfrac{di(t)}{dt} + 2i(t) = 4e^{2t}$
Find the expression for i(t) if initial conditions are i(0)= -3 Amp and di(0) / dt =5 Amp/ sec
OR
If a D.T.system is represented as $y[n]= 0.5(x[n]+ x[n-2])$ find
i) Transfer function of the system
ii) Draw magnitude and phase response in frequency range $[-\pi$ to $\pi]$</td><td>10</td></tr>
<tr><td>Q4 (b)</td><td>(i) The Probability density function $P(X)= ae^{-b|X|}$ where X is a random variable whose values lie in the range $-\infty$ to $+\infty$. Calculate CDF for the function for $X \geq 0$.
(ii) Compare deterministic and random signals with suitable examples</td><td>05

05</td></tr>
<tr><td>Q5 (a)</td><td>Find Fourier Transform and sketch spectrum for → magnitude spectrum
(i) Signum function : sgn(t)
(ii) $x(t) = e^{at} u(-t) + e^{at} u(t)$ for $a > 0$</td><td>10</td></tr>
<tr><td>Q5 (b)</td><td>Express following signal in terms of Exponential Fourier series. Hence draw magnitude spectrum


$x(t) = 1 + t$; for $-1 \leq t \leq 0$
$= 1 - t$; for $0 \leq t \leq 1$
OR
Determine Fourier series representation and magnitude spectrum of following discrete time signal
$x[n]= \cos(2\pi /5)n$</td><td>10</td></tr>
</table>