GITAM INSTITUTE OF TECHNOLOGY
GITAM UNIVERSITY

(Declared as deemed-to-be-University u/s 3 of UGC Act, 1956)
Rushikonda, Visakhapatnam-530 045(AP)
Accredited by NAAC with 'A'Grade

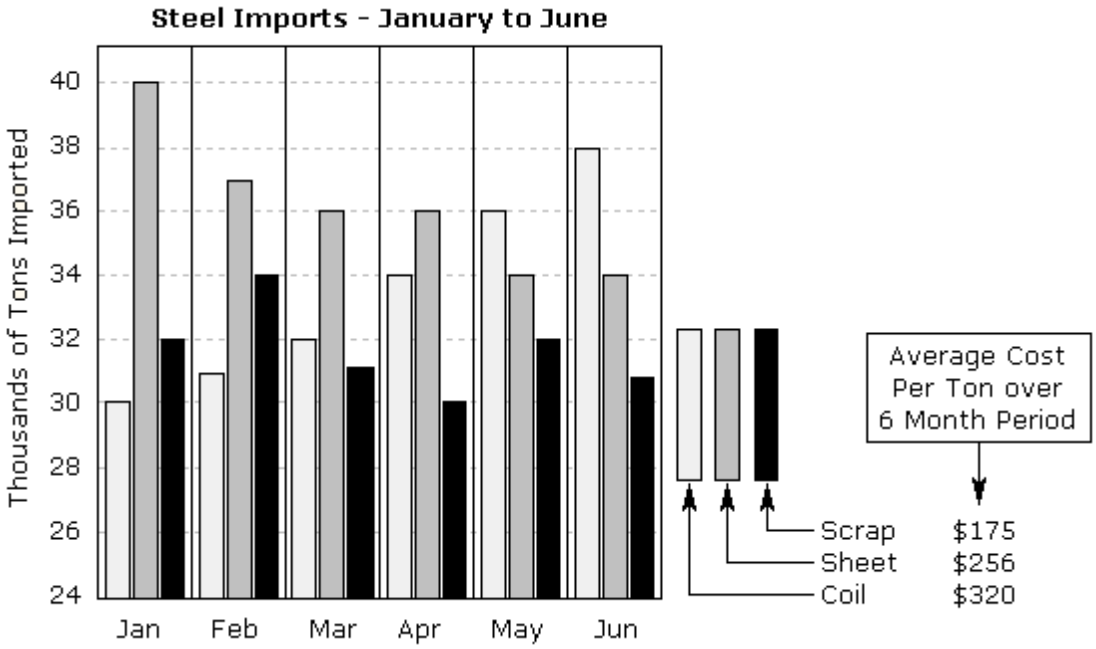
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
Model Question Paper for Ph.D. Entrance Examination (2012-13)

Note: **1. Answer all questions** **2. All questions carry equal marks.**

Maximum Marks: 60 **Time: 2hrs.**

1. What is the significance of Bibliography

2.

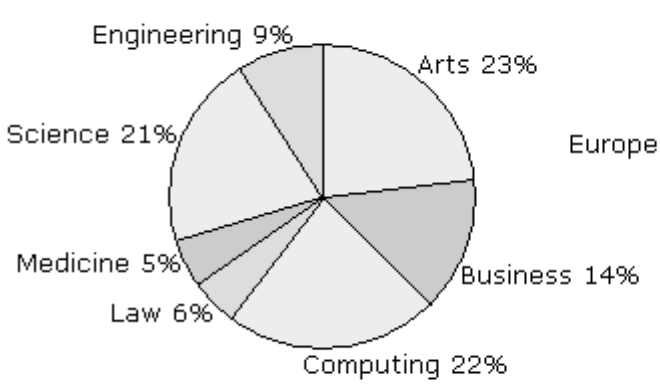


The figure above shows imports for three types of steel over a six month period. Use this information to answer the following questions.

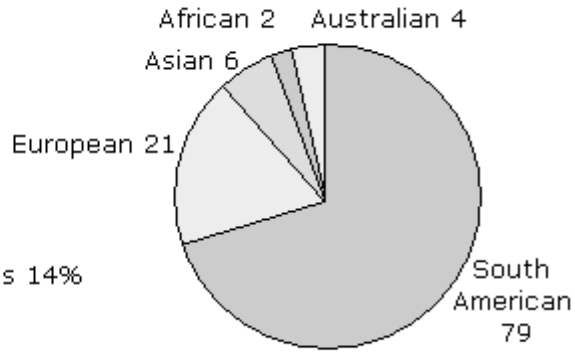
a) Which month showed the largest decrease in total imports over the previous month?

b) What was the percentage of scrap steel imported in the 6 month period?

3.



Students by Faculty



Arts Students (Non-US)

The pie charts above show the percentage of students in each faculty at North West University and the number of non-US students in the Arts faculty. These percentages have been rounded to the nearest whole number. There are a total of 1049 students in the Arts faculty. Use this information to answer the following questions.

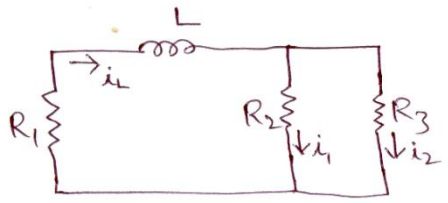
a) How many students are there in the Engineering faculty?

b) If six percent of Science students are Asian. How many Asian students are there studying Science?

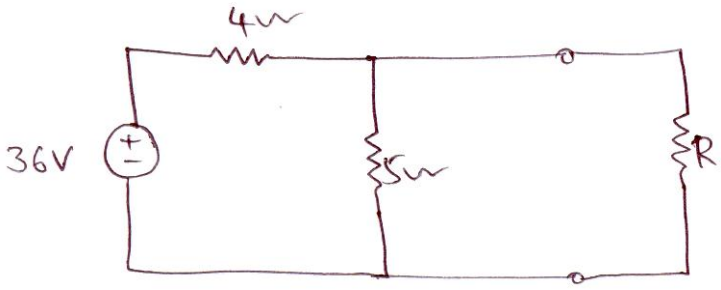
4. If $A = \begin{pmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{pmatrix}$. Find eigen values of A and A^2.

5. Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = \sin(2\log(1+x))$.

6. What is the time constant for the network shown in figure?



7. In the network shown in figure, the resistor R absorbs maximum power. Compute the values of R and maximum power.



8. Discuss about the effect of emitter-bypass capacitor on low frequency response of an RC coupled amplifier?

9.What is frequency stability of an oscillator?

10. What are the advantages of a crystal oscillator?

11. What is fidelity of an amplifier?

12. Derive an expression for conversion efficiency of a resistive load class-A power amplifier?

13. Draw the hybrid-Π model of a transistor?

14. Minimize the following four variable logic function using Karnaugh map method.

F (A, B, C, D) = ∑ m (0, 1, 2, 3, 5, 7, 8, 9, 11, 14)

15. Design NAND and NOR gates using CMOS logic.

16. Simplify the Boolean function

F = A'B'C'+B'CD'+A'BCD'+AB'C' using K-map.

17. Find the system function of a casual discrete time LTI system which is characterized by the difference equation.

y(n)-3/4y(n-1)+1/8y(n-2)=2x(n) for $x(n)=(1/4)^n u(n)$.

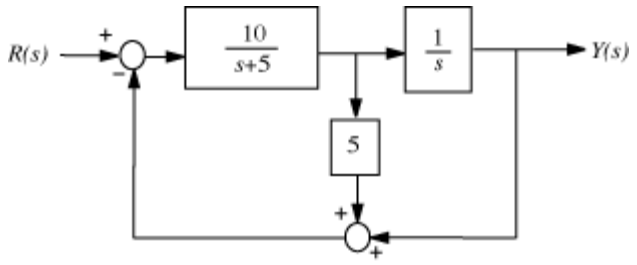
18. Find whether the following system characterized by it impulse response

$h(n)=(-1/2)^n u(n)+(1.01)^n u(n-1)$ is causal and stable.

19.A discrete time signal is given as

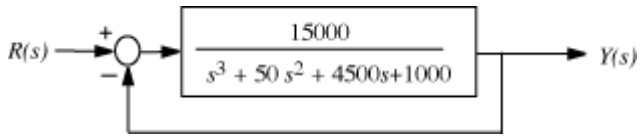
$x(n)=a^n u(n)$ for $-1 < a < 1$. Determine its energy density spectrum.

20. Consider a system represented by the block diagram



The closed-loop transfer function *T(s)=Y(s)/ R(s)* is ------

21. Consider the closed-loop system:



Compute the closed-loop transfer function and the closed-loop zeros and poles.

22. In a broadcast super heterodyne receiver having no RF amplifer,the loaded Q of the antenna coupling circuit is 100. If the intermediate frequency is 455 kHz. Calculate the image frequency and its rejection at 1000 kHz.

23. Find the carrier and modulating frequencies, the modulation index and the maximum deviation of the FM wave represented by the voltage equation

$$v(t) = 12\sin(6\times10^{8}t + 5\sin 1250t)$$

Find the power this FM wave dissipate in a 10 Ω resistor?

24. A carrier is simultaneously modulated by 2 sine waves with modulation indices of 0.3,0.4. Find the total modulation index.

25. A signal of maximum frequency of 10 KHz is sampled at Nyquist rate. Find the time interval between two successive samples.

26. Calculate the power spectral density of a stationary random process for which the Autocorrelation function $R_{xx}(\tau) = \sigma^2 e^{-\alpha |\tau}$

27. Consider an angle modulated signal $x(t)=3\cos[2\pi 10^6 t+2\sin(10^3 t)]$.
Find instantaneous frequency at time t=0.25 and also find the maximum frequency deviation.

28.Find the depth of penetration, δ of an EM wave in copper at f = 60 Hz and f = 100 MHz. For copper $\sigma = 5.8 \times 10^7$ mho/m , $\varepsilon_r = 1$, $\mu_r = 1$.

29. The attenuation coefficient of a transmission line is 0.2mNp / m. Find the attenuation coefficient in dB/m and dB/mile.

30.When a wave of 6 GHz propagates in parallel conducting plates separated by 3cm, find the phase velocity, group velocity of the wave for the dominant mode.

SYLLABUS FOR Ph.D ENTRANCE EXAMINATION IN ELECTRONICS AND COMMUNICATION ENGINEERING (2012-13)

General :

Basic elements of Research Paper and Thesis

Computer knowledge on development of graphs bar charts and pi charts

Linear differential equations of higher order with constant coefficients – Cauchy, Legender's homogeneous equations – simultaneous linear differential equations. Rank of a matrix – eigen values and eigen vectors – Caylgey Hamilton theorem – quadratic forms. Correlation – coefficient of correlation – lines of regression – rank correlation.

Networks: Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Nortons maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-I-n and avalanche photo diode, Basics of LASERs. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi-stage, differential and operational, feedback, and power. Frequency

response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Powersupplies.

Digital circuits: Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor(8085): architecture, programming, memory and I/O interfacing.

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication

systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss and Stokes theorems, Maxwells equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain