Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.  Question                                      M.M.
1(a)  With the aid of suitable diagrams, explain the difference between Czochralski and
      Float Zone crystal growth processes. Which of these is referred in the present day
      fabrication industry.                                      [08]
1(b)  How is Dry Etching performed using Reactive Ion and Sputter techniques.                [07]

OR

1'(a) Using the labelled diagrams, explain the difference between Contact, Proximity and
      Projection printing in the context of Optical Lithography. [08]
1'(b) Draw the schematic of electron-beam exposure system and thereafter explain the
      process of Electron Beam Lithography.                     [07]

2(a)  Tabulate the advantages of BiCMOS technology over standard CMOS technology.          [08]
2(b)  In the context of the fabrication of an ‘on-chip’ inductor,
      i.  What are technological options? Explain, in detail, the most suitable
           technology for inductor realization.                   [07]
      ii. What range of inductance values are typically obtainable?

OR

2'(a) Write short technical notes on the following;                                        [15]
      1. Ion Implanter
      2. Molecular Beam Epitaxy
      3. Latch-up in CMOS circuits

cont...
4. Oxide thickness Characterization

5. Wet etching

3(a) With suitable diagrams to support your answer, discuss the advantages and limitations of Guard Ring and Trench isolation schemes.

3(b) A floating capacitor of value 15pF is required for some application. How can this capacitor be implemented using metal-2 for the top plate?

4(a) Draw the colored layout diagrams for resistances, along with their metal contacts, of the following values: 100Ω and 560Ω.

4(b) The colored layout for the circuit shown below using the design rules for Double-Metal, Double-Poly, n-well, bulk CMOS process.
2013-2014
B.TECH WINTER (VI SEMESTER) EXAMINATION
(ELECTRONICS ENGINEERING)
EL-314-N
SEMICONDUCTOR DEVICE MODELING
CREDITS: 04

Maximum Marks: 60
Duration: Three Hours

<table>
<thead>
<tr>
<th>Qs</th>
<th>Instructions</th>
<th>Marks</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><strong>Values of some constants:</strong> Energy gap for Si = 1.12 eV; Thermal voltage (kT/e = 25 mV at room Temp.); Permittivity of free space (ε₀ = 8.85x10⁻¹² F/m); Permittivity of silicon (εᵦᵦ = 12 ε₀); Permittivity of oxide (εᵦᵦᵦ = 3.9 ε₀); Nᵦ = 2.8x10¹⁹ cm⁻³; Nᵥ = 1.04x10¹⁵ cm⁻³; nᵦ = 1.04x10¹⁰ cm⁻³</td>
<td></td>
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1 (a) How does the conductivity of a solid depend on whether the energy bands are completely filled, partially filled or empty? How does the existence of overlapping bandgaps affect the conductivity?  
(b) What is the value of the Fermi function at an energy, which is 3kT higher/lower than the Fermi energy?  
(c) Explain why the mobility in a semiconductor depends on the doping density.  
(d) What is the driving force, which causes diffusion?  
(e) List three recombination-generation mechanisms.  
(f) A piece of germanium doped with 10x10¹⁶ cm⁻³ shallow donors is illuminated with light generating 10x10¹⁵ cm⁻³ excess electrons and holes. Calculate the quasi-Fermi energies relative to the intrinsic energy and compare it to the Fermi energy in the absence of illumination.  

OR

(f) A 1cm long piece of undoped silicon (shown in Figure-1) with a lifetime of 1ms is illuminated with light, generating Gᵦᵢᵦᵦ = 2x10¹⁹ cm.s⁻¹ (gen. rate) electron-hole pairs in the middle of the silicon.  

contd... 2
This bar silicon has ideal Ohmic contacts on both sides. Find the excess electron density throughout the material using the simple recombination model and assuming $\mu_n = \mu_p = 1000 \text{cm}^2/\text{V.s}$ Also find the resulting electron current density throughout the material.

2(a) Explain the difference between depletion and diffusion capacitance.

2(b) Explain the recombination and generation currents in pn junction diodes.

2(c) Name two breakdown mechanisms in pn junction and explain them.

2(d) Define the barrier height of a metal-semiconductor junction. Can the barrier height be negative? Explain.

2(e) How does the energy band diagram of a metal-semiconductor junction change under forward and reverse bias? How does the depletion layer width change with bias?

5(f) An abrupt silicon p-n junction consists of a p-type region containing $N_a = 10 \times 10^{16} \text{cm}^{-3}$ acceptors and an n-type region containing also $N_a = 10 \times 10^{16} \text{cm}^{-3}$ acceptors in addition to $N_d = 10 \times 10^{17} \text{cm}^{-3}$ donors.

I. Calculate the thermal equilibrium density of electrons and holes in the p-type region as well as both densities in the n-type region.

II. Calculate the built-in potential of the p-n junction.

III. Calculate the built-in potential of the p-n junction at 400K.

OR

5(f') Consider an abrupt p-n diode with $N_a = 10 \times 10^{18} \text{cm}^{-3}$ and $N_d = 10 \times 10^{16} \text{cm}^{-3}$. Calculate the junction capacitance at zero bias. The diode area equals $10^{-4} \text{cm}^2$.

Repeat the problem while treating the diode as a one-sided diode and calculate the relative error.

3 Discuss any five of the following.

I. Minority carrier profile in BJT

II. Current components in BJT
<p>| | |</p>
<table>
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<tbody>
<tr>
<td>III.</td>
<td>Derive the expression of $I_C$ as function of $V_{BE}$.</td>
</tr>
<tr>
<td>IV.</td>
<td>Emitter current crowding</td>
</tr>
<tr>
<td>V.</td>
<td>Gummcl-Poon model</td>
</tr>
<tr>
<td>VI.</td>
<td>Breakdown in BJTs</td>
</tr>
<tr>
<td>VII.</td>
<td>Complete small signal model for BJT</td>
</tr>
</tbody>
</table>

| 4(a) | For a MOS capacitor with n-type substrate: show the energy band diagram for accumulation, depletion, intrinsic and inversion region (assuming $V_{FB} = 0$). |
|   |   |
| (b) | Define surface potential and bulk potential. Derive the expression of threshold voltage of MOSFET. |
|   |   |
| (c) | Draw the low and high frequency C-V characteristics, clearly showing the relevant details for a two terminal MOS structure having 30 nm thick oxide and substrate doping $N_A = 1 \times 10^{15} \text{cm}^{-3}$. Assume $V_{FB} = 0$. |
|   |   |
|   | OR |
|   |   |
| 4(c) | What is the need of accurate MOSFET models? Describe the various circuit models available for MOSFETs. What are the second order effects present in MOSFETs? |
|   |   |
|   |   |
2013-14
B.TECH. (WINTER SEMESTER) EXAMINATION
ELECTRONICS ENGINEERING
CONTROL SYSTEMS
EL-321
(OLD COURSE)

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.

1. State the Nyquist stability criterion.

Without drawing the Nyquist plot, find the number of encirclements, $N$, of the $-1 + j0$ point, in the $G(s)H(s)$ - plane, for the system having its open-loop transfer function:

$$G(s)H(s) = \frac{10}{s(s + 3)(s^2 + s + 1)}$$

Comment on the stability of the closed-loop system.

OR

1'. Define gain margin and phase margin of a control system.

Determine the value of $K$ graphically, for a unity feedback control system having

$$G(s) = \frac{K}{s(1+s)(1+0.1s^2)}$$ so that its gain margin is 15 db.

2. Draw the complete root-locus diagram for the following characteristic equation of a feedback control system:

$$s^3 + 3s^2 + (K + 2)s + 10K = 0$$
3. For a unity feedback control system with \( G(s) = \frac{K}{s(1+0.2s)} \), design a suitable compensation to meet the following specifications:

(i) velocity error constant \( \geq 20 \)

(ii) phase margin \( \geq 45^\circ \)

OR

3'. What are PID controllers? Mention their effects on system's performance.

Fig. shows a control system using derivative control in its feedback. Determine the tachometer constant, \( K_t \) so as to obtain the damping ratio equal to 0.4.


Construct a Lyapunov's function of the following system using variable-gradient method and hence, examine the stability of the system:

\[
\begin{align*}
\dot{x}_1 &= -x_1 + 2x_1^2x_2 \\
\dot{x}_2 &= -x_2
\end{align*}
\]

5. What are the methods for the optimal control systems studies?

Find the extremal of the functional:

\[
f(x) = \int_0^{\pi/4} (x_1^2 + x_2^2 + \dot{x}_1 \dot{x}_2) \, dt
\]

the ICs are \( x_1(0) = 0, x_1(\pi/4) = 1, x_2(0) = 0, x_2(\pi/4) = -1 \)
1. (a) Discuss one technique of phase estimation.
(b) Prove that, if $s_1(t)$ and $s_2(t)$ are orthogonal baseband signals with identical absolute bandwidth $B$, then $s_1(t)\cos(2\pi f_c t)$ and $s_2(t)\cos(2\pi f_c t)$ are orthogonal signals as well, provided that $f_c > B$. Give an example for which the statement fails when $f_c < B$.
(c) Consider the two basis functions shown in Fig - 1.

$$\begin{align*}
&\text{Fig - 1} \\
&\text{Sketch the waveforms corresponding to the following signal constellations.}
\end{align*}$$

OR

(c') Binary data is transmitted using polar signaling over an AWGN channel with noise power spectral density $N_0/2$. The two signals used are $s_1(t) = s_2(t) = \sqrt{E_0} \cos(\theta(t))$. The symbol probabilities are unequal. Design the optimum receiver and determine the corresponding error probability.

2. (a) Define bandwidth efficiency. Compare $M$-ary PSK with $M$-ary FSK modulation techniques on the basis of their bandwidth efficiencies.
(b) Show that a CPFSK signal with modulation index $k=1/2$ has a constant envelope. Sketch a block diagram of the modulator for synthesizing the signal.
(c) Given three QAM constellations shown in Fig - 2. Which constellation has the lowest probability of bit error and which has the highest? Why?
The differential carrier phase $\Delta \theta_k$ of a $\pi/4$ shifted DQPSK is governed by the mapping

$$
\Delta \theta_k = \begin{cases} 
-3\pi/4 & \text{for } b_k = -3 \\
-\pi/4 & \text{for } b_k = -1 \\
\pi/4 & \text{for } b_k = 1 \\
3\pi/4 & \text{for } b_k = 3 
\end{cases}
$$

Where $\{b_k\}$ denotes the incoming data sequence. Formulate the expression for the complex envelope of the $\pi/4$ shifted DQPSK signal.

3. (a) A ternary channel matrix is given by

$$
p(Y|X) = \begin{pmatrix} 
y_1 & y_2 & y_3 \\
x_1 & 1 & 0 & 0 \\
x_2 & 0 & 0.8 & 0.2 \\
x_3 & 0 & 0.2 & 0.8 
\end{pmatrix}
$$

Given a priori probabilities as: $P(x_1)=0.4$, $P(x_2)=P(x_3)=0.3$. Determine $H(X)$, $H(Y)$, $H(X|Y)$ and $I(X;Y)$.

(b) Differentiate between
(i) Self information and entropy
(ii) Hartley and bit
(iii) ARQ and FEC

(c) Four codewords of a linear block code, $\mathcal{C}$, are as follows:

1101000, 0110100, 0011010, 0001101.

(i) Show that these 7-tuple vectors are linearly independent.
(ii) Find the remaining codewords of the code $\mathcal{C}$.
(iii) Determine a generator matrix $G$ for the code.

How many errors this code can correct?

4. (a) A spread spectrum communication system has a bit duration, $T_b=4.095$ ms and chip duration, $T_c=1\mu s$. Find the jamming margin if the required $E_b/N_0=10$ for satisfactory reception.

(b) In a fast FHSS system, the information is transmitted via FSK, with noncoherent detection. Suppose there are 3 hops/bit, with hard decision decoding of the signal in each hop.

(i) Determine the probability of error for this system in an AWGN channel with power spectral density $N_0/2$ and SNR=13 dB (total SNR over 3 hops).
(ii) Compare the result in (i) with the error probability of an FHSS system that hops once per bit.

OR

(b') Derive an expression for DSSS system that employs BPSK modulation.
Q. No. | Question | MM
---|---|---
1 a | Determine the unit step response of the system described by the following difference equation. 
y[n] = 0.6y[n - 1] - 0.08y[n - 2] + x[n] | 7
1 b | A FIR filter has an impulse response $h[n]$ for the input $x[n]$. Find the output using linear as well as circular convolution for the following conditions: 
$h[n] = [1, 2, 4]$, $x[n] = [1, 2]$ | 8

OR

1'a | Consider the following discrete time signals: 
$x[n] = \cos(1.5n)$ and $y[n] = \frac{1}{\pi} \sin(\frac{n}{5})$
Compute the convolution $(x[n])^2 * y[n]$ | 5
1'b | Explain how in-place computation is performed to compute DFT of a sequence. | 3
1'c | Determine the response of the system with an impulse response: 
$h[n] = a^n u[n]$ to the input signal 
$x[n] = u[n] - u[n-10]$ | 7

2 a | For a stable and causal system the poles and zeros of the magnitude squared response are located as follows: 
$p_1 = 0.8e^{-j\pi/4}$, $p_2 = 0.8e^{-j3\pi/4}$, $p_3 = (0.8e^{-j\pi/4})^{-1}$, 
$p_4 = (0.8e^{-j3\pi/4})^{-1}$, $z_1 = z_2 = 1$, $z_3 = -0.5$, $z_4 = -2$ 
Find the transfer function of the system. | 5
2 b | Determine the parallel realization of the IIR filter with the transfer function: 
$$H(z) = \frac{\left(1 + \frac{1}{z^{-1}}\right)}{\left(1 + \frac{1}{2}z^{-1}\right)\left(1 + \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2}\right)}$$ | 6
2 c | Why is phase characteristics of a system important? Differentiate between a minimum phase and maximum phase system. | 4
2'a Calculate the number of adders, multipliers and delay units required to implement an IIR filter with N poles and M zeros using Direct Form I and Canonical Form of realization.

2'b A second order Butterworth filter has the following normalized transfer function

\[ H(s) = \frac{1}{s^2 + \sqrt{2}s + 1} \]

Design an IIR filter based on this analog filter using the impulse invariant method.

2'c Determine the order of a lowpass Butterworth filter that has a -3 dB bandwidth of 500 Hz and an attenuation of 40 dB at 1000 Hz.

3 a What is the significance of tapering the window at the boundaries?

3 b Consider a causal FIR lowpass filter with the following transfer function:

\[ H[z] = 0.005 + 0.03z^{-1} + 0.11z^{-2} + 0.22z^{-3} + 0.27z^{-4} + 0.22z^{-5} + 0.11z^{-6} + 0.03z^{-7} + 0.005z^{-8} \]

(i) Is the filter linear phase. If so, what is the type? Answer with justification.

(ii) What is the group delay of the filter.

(iii) Realize the above filter using minimum hardware complexity.

4 a Assume \( x(t) \) is a continuous time pure sinusoid at 10kHz. It is sampled at 8kHz. What will be the perceived frequency of the interpolated sinusoid if:

(i) Sampled signal is converted back to contiguous time with an interpolator at 8kHz.

(ii) Sampled signal is converted back to contiguous time with an interpolator at 24kHz.

4 b Find the overall transformation operated by the following system:

\[ x[n] \rightarrow 2\downarrow \rightarrow H_2(z^2) \rightarrow 2\uparrow \rightarrow H_1(z^2) \rightarrow 2\downarrow \rightarrow y[n] \]

4 c Explain the floating point number representation used in DSP processors.
Q.No. | Question | M.M.
---|---|---
1(a) | Discuss the similarities between following national transport networks and a communication networks. Is the transport system more similar to telephone network or packet network? (i) Rail network (ii) Airline network (iii) Highway network. | [03]

OR

1'(a) | Consider two hosts, Hosts A and B, connected by a single link having data rate of 28 kbps. Suppose that the two hosts are separated by \( m \) meters and propagation speed along the link is \( 2.5 \times 10^8 \) \( m/sec \). Host A is to send a packet of size 100 bits to Host B. Find propagation delay \( t_{prop} \) and transmission time \( t_{trans} \). Find the distance \( m \) so that at \( t=t_{trans} \) the recipient host B will just start receiving the first bit. | [03]

1(b) | Which OSI layer is responsible for the following? | [03]

   (i) Determine best path to route the packets.

   (ii) Providing node-to-node communications with reliable service.

   (iii) Providing end-to-end communications with reliable service.

1(c) | In layered network architecture, define protocol and services. Differentiate between them by appropriate examples in OSI layer framework. | [03]

1(d) | Let \( g_1(x) = x + 1 \) and let \( g_2(x) = x^3 + x^2 + 1 \). Consider the information sequence 110110. | [06]

   (i) Find the codeword corresponding to these information bits if \( g_1(x) \) is used as the generating polynomial.

cont'd... 2
(ii) Find the codeword corresponding to these information bits if \( g_2(x) \) is used as the generating polynomial.

(iii) Find the codeword corresponding to these information bits if \( g(x) = g_1(x)g_2(x) \) is used as the generating polynomial. Comment on the error-detecting capabilities of \( g(x) \).

OR

1(d') A telephone modem is used to connect a personal computer to a host computer. The speed of the modem is 56 kbps and the one-way propagation delay is 100 ms.

(i) Find the efficiency of Stop-and-Wait ARQ if the frame size is 256 bytes. Assume a bit error rate of \( 10^{-4} \).

(ii) Find the efficiency of Go-Back-N if three-bit sequence numbering is used with frame size of 512 bytes. Assume a bit error rate of \( 10^{-4} \).

2(a) In a LAN, which MAC protocol has a higher efficiency: ALOHA or CSMA-CD. Why? What about in a WAN? Explain.

2(b) Suppose that slotted ALOHA protocol is used to share a 56 kbps satellite channel. Suppose that frames are 1000 bits long. Find the maximum throughput of the system in frames/second.

2(c) Provide a brief answer and explanation of each of the following:

(i) Under a light load, which LAN has smaller delay: Ethernet or token ring?

(ii) Under a high load, which LAN has smaller delay: Ethernet or token ring?

OR

2'(a) Suppose that a LAN is to carry voice and packet data traffic. Discuss what provisions if any are required to handle the voice traffic in the reservation, polling, token ring, ALOHA and CSMA-CD environments. What changes, if any, are required for the packet data traffic?

2'(b) Consider four stations that are all attached to two different bus cables. The stations exchange fixed-size frames of length 1 second. Time is divided into slots of
1 second. When a station has a frame to transmit, the station chooses either bus with equal probability and transmits at the beginning of the next slot with probability $p$. Find the value of $p$ that maximizes the rate at which frames are successfully transmitted.

2'(c) Why is it that the Ethernet standard, which was designed for broadcast networks, is not used in wireless networks? 

3(a) With the help of suitable diagrams, explain the concept of hierarchical routing. How it helps in reducing the size of routing tables of routers?

3(b) Why Time-to-live (TTL) field is used in each packet? How it helps to reduce excessive packet generation?

OR

3(b') Discuss sliding window protocol of flow control.

3(c) Consider the network shown in Fig. 1.

![Fig. 1](image)

(i) Use Bellman-Ford algorithm to find the set of shortest path from all node to destination node 2.

(ii) Now repeat the algorithm after the link between node 2 and 4 goes down.

4(a) A host in an organization has an IP address 150.32.64.34 and subnet mask 255.255.240.0. What is the address of this subnet? What is the range of IP addresses that a host can have on this subnet?

contd... 4
4(a') (i) Perform CIDR aggregation on the following /24 IP addresses: 128.56.24.0/24, 128.56.25.0/24, 128.56.26.0/24, 128.56.27.0/24.

(ii) Abbreviate the following IPv6 addresses:
2819:00AF:0000:0000:0000:0000:0035:0CB2:B278

4(b) Suppose a router receives an IP packet containing 600 data bytes and has to forward the packet to a network with maximum transmission unit of 200 bytes. Assume that the IP header is 20 bytes long. Show the fragments that the router creates and specify the relevant values in each fragment header (i.e., total length, fragment offset, and more bit).

4(c) At time \( t \), a TCP connection has a congestion window of 4000 bytes. The maximum segment size used by the connection is 1000 bytes. What is the congestion window after it sends out 4 packets and receives ACKs for all of them:

(i) If the connection is in slow-start?

(ii) If the connection is in congestion avoidance (AIMD mode)?
Answer all the questions.
Assume suitable data if missing.
Notations used have their usual meaning.

Q.No.       Question                                                                 M.M.
1(a). Define binary, ternary and quaternary semiconductor compounds. What are their [04]
unique properties that make them different from each other?
1(b). "Sandwiching differently composed alloy layers, both carrier and optical fields are [03]
confined in the central layer". Prove this statement with the help of diagrams.
1(c). Derive the threshold conditions for oscillations to take place in a Fabry-Perot cavity [03]
laser.
1(d). What are Cleaved Coupled Cavity ($C^3$) lasers? Explain with suitable diagrams. [05]

OR

1(a)'. An AlGaAs laser diode has 500 $\mu$m cavity length which has an effective absorption [04]
coefficient of 10 $\text{cm}^{-1}$.

(i) For uncoated facets the reflectivities are 0.32 at each end, what is the optical [01]
gain at the lasing threshold?

(ii) If one end of the laser is coated with dielectric reflector so that its reflectivity [01]
is now 90%, what is the optical gain at the lasing threshold?

(iii) If the internal quantum efficiency is 0.65, what is the external quantum [01]
efficiency in the above two cases?

1(b)'. What do you understand by electroluminescent process? Derive the expressions for [05]
internal and external quantum efficiency in case of LEDs.

1(c)'. Differentiate the following:

(i) Gain guided and Index guided lasers
(ii) Positive and Negative index guided lasers

(iii) Quantum Well and Stripe Geometry lasers

2(a). What type of photo-detector would you recommend to be used for following applications: - (i) low noise, (ii) high gain, and (iii) large bandwidth?

2(b). What is the basic principle of operation of junction photodiodes?

2(c). What do you understand by Separate-Absorption-and-Multiplication (SAM) Avalanche Photodiode (APD)? What variations can be done in SAM APD to have additional advantages?

OR

2(a). What is a p⁺n⁻p⁺ reach-through avalanche photodiode? Explain its working.

2(b). Define the following:
(i) Avalanche multiplication  (ii) Responsivity  (iii) Photovoltaic effect
(iv) Photo-detector noise  (v) Opto-couplers

2(c). Write down the characteristics of photo-transistor and explain its working.

3(a). Explain the amplification mechanism in Erbium Doped Fiber Amplifiers (EDFAs), with suitable diagrams.

3(b). What is the need for integration of optical and electronic devices? What are the challenges associated with such type of integration?

3(c). What are the advantages and disadvantages of Semiconductor Optical Amplifiers?

3(d). What are optical bistable devices?

4(a). Give the classification of optical modulators.

4(b). How can you obtain an electro-optic amplitude modulator using KH₂PO₄ (KDP) crystal? Give detailed analysis.

4(c). What do you understand by Self Electro-optic Effect Devices (SEEDs)? Explain how SEEDs can be used as optical switches.

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2013-14
B.TECH. (WINTER END SEMESTER) EXAMINATION
ECONOMICS AND MANAGEMENT
ME 340 [240]

Maximum Marks: 60 Credits: 04 Duration: Three Hour

Answer all the questions.
Notations used have their usual meaning.
Assume suitable data if missing

<table>
<thead>
<tr>
<th>Q No.</th>
<th>Question</th>
<th>M.M.</th>
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<tbody>
<tr>
<td>1(a)</td>
<td>A new piece of materials handling equipment costs Rs. 20,000 and is expected to save Rs. 7500 the first year of operation. Maintenance and operating cost increases are expected to reduce the net saving by Rs. 500 per year for each additional year of operation until the equipment is worn out at the end of 8 years. Determine the net present worth of the equipment at an interest rate of 12 percent.</td>
<td>[5]</td>
</tr>
<tr>
<td>1(b)</td>
<td>A 50-kilowatt gas turbine has an investment cost of $40,000. It costs another $14,000 for shipping, insurance, site preparation, fuel lines and fuel storage tanks. The operation and maintenance expense for this turbine is $450 per year. Additionally, the hourly fuel expense for running the turbine is $7.50 per hour, and the turbine is expected to operate 3,000 hours each year. The cost of dismantling and disposing of the turbine at the end of 8 year life is $8000. If the interest rate is 15% per year, what is the annual equivalent life cycle cost of the gas turbine?</td>
<td>[5]</td>
</tr>
<tr>
<td>1(c)</td>
<td>State the law of supply and demand?</td>
<td>[2]</td>
</tr>
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</table>

OR

1'(a) Assets A1 and A2 have the capability of satisfactorily performing a required function. Asset A2 has an initial cost of $3200 and an expected salvage value of $400 at the end of its 5 year service life. Asset A1 costs $900 less initially, with an economic life of 10 years, has no salvage value, and its annual operating cost exceed those of A2 by $250. When the required rate of return is 15%, state which alternative is preferred when comparison is by present worth method | [7] |

1'(b) Differentiate between GDP and GNP. | [2] |

1'(c) Explain Elasticity of demand, by giving suitable examples. | [3] |

2(a) At the end of one-half of its expected economic life, a 4-year old machine has a book value of $5800 from its original cost of $9200. Estimated operating costs for next year will amount to $6000. An equipment dealer will allow $3600 if the machine is traded in now and $2800 if it is traded in 1 year later. The dealer proposes the purchase of a new machine to perform the same function; it will cost | [6] |

Contd. 2
$14,000 installed. This machine will have an estimated operating cost of $4500 per year and a salvage value of $3000 at the end of 4 years. Is it profitable to replace the existing machine now if the minimum return on investments is 15% before taxes?

2(b) A materials testing machine was purchased for $20,000 and was to be used for 8 years with an expected salvage value of $2000. Calculate depreciation charge for year 4 and book value at end of year 3 by using double declining balance method.

2(c) What are the causes and consequences of inflation?

3(a) Is there any difference between managerial roles and managerial skills? Giving suitable examples, explain various managerial skills.

OR

3(a') What are the four basic activities of management? Explain using suitable examples.

3(b) What are the three areas of ethics which may be of special concern for managers?

OR

3(b') What are the arguments for and against social responsibility?

3(c) Discuss the role of information in a manager's job. What are the various characteristics of useful information?

OR

3(c') Explain the differences between three common methods of group decision making: Interacting groups, Delphi groups and Nominal groups.

4(a) What do you understand by organizational planning? Differentiate among strategic, tactical and operational plans.

4(b) What is the difference between chain of command and span of control?

4(c) How is the leadership different from management? Does an organization need both managers and leaders?

OR

4'(a) What are the various levels of control system in an organization? Explain the four fundamental steps for any control process.

4'(b) What is the importance of employee motivation? Explain the difference between human relation approach and human resource approach.
4(c) What is the concept of job specialization? Compare the benefits and limitations of job specialization. [4]

5(a) Explain exponential smoothing method of demand forecasting.
A company has experienced irregular and usually increasing demand for disposable kits. The demand for September was 300 units and for October were 350 units. Using 200 units as September forecast and a smoothing coefficient of 0.7 calculate the forecast for the months of October and November. [5]

5(b) A television manufacturer requires 24,000 two-centimetre-long pieces of wire every month for assembly. Ordering costs are estimated at $42, and cost of carrying is 25 percent of unit price, which is $0.08. Assuming delivery is instantaneous; find the reorder point and economic order quantity. [3]

5(c) Explain the difference between macroeconomics and microeconomics in the context of financial management. [4]