EXTC

AME (Rev/ Special Exam)

QP Code : 2640

(3 Hours)   Sub: - AME   [Total Marks : 100]

N.B. : (1) Question No.1 is compulsory.
     (2) Solve any four questions out of remaining six questions.
     (3) Use of smith chart is allowed.
     (4) Figures to the right indicate full marks.

1. (a) What is an unilateral figure of merit of an amplifier?   5
   (b) Define signal to noise ratio and noise figure with help of a noisy network.   5
   (c) Define stability. List the various criteria for stability.   5
   (d) Explain the terms conversion loss and isolation with reference to mixer.   5

2. (a) For an ideal transformer with turns ratio $n = \%$. Prove that the scattering matrix   10
is :

$$S = \begin{bmatrix} \dfrac{n^2-1}{n^2+1} & \dfrac{2n}{n^2+1} \\ \dfrac{2n}{n^2+1} & \dfrac{1-n^2}{n^2+1} \end{bmatrix}$$

   (b) Discuss amplifier linearization methods.   10

3.   A GaAs FET has the following S-parameter and noise parameters at 1.0 GHz   20
($Z_0 = 50\ \Omega$) $S_{11} = 0.61 < -155^0$, $S_{12} = 0$, $S_{21} = 5.0 < 180^0$, $S_{22} = 0.51 < -20^0$,
$F_{min} = 3dB$, $\Gamma_{opt} = 0.45 < 180^0$, $R_N = 4\Omega$. Design a Low noise amplifier for a noise
figure of 3.5dB and power gain of 16 dB.

4. (a) Derive the transducer power gain as   10

$$G_T = \frac{P_L}{P_{av}} = \frac{|S_{21}|^2 \left(1-|\Gamma_s|^2\right)\left(1-|\Gamma_L|^2\right)}{|1-\Gamma_s\Gamma_{in}|^2\ |1-S_{22}\Gamma_L|^2}$$

   (b) Design a transistor oscillator at 4 GHz using GaAs FET in common gate configuration   10
with 5nH inductor in series. Common gate configuration S-parameters are
$S_{11} = 2.18 < -35^0$, $S_{21} = 2.75 < 96^0$, $S_{12} = 1.26 < 18^0$, $S_{22} = 0.52 < 155^0$,   10
Select Γ_G so that $\Gamma_{in} > 1$.

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5. (a) Explain using suitable diagrams two methods of designing broadband amplifier.
   (b) Discuss generator tuning networks for microwave oscillators.

6. (a) Explain in detail single ended diode mixer. Also explain mixer design aspects.
   (b) A BJT with I_c = 30mA and V_{cc} = 10 V is operated at a frequency of 1.0 GHz in a 50 Ω system.
   $S_{11} = 0.73 < 175^0$, $S_{22} = 0.21 < -89^0$, $S_{12} = 0.0$, $S_{21} = 4.45 < 65^0$
   Is the transistor unconditionally stable? If yes, calculate the optimum termination
   G_{Smax}, G_{Lmax} and G_{TUmax}.

7. Write short note on :
   (a) Noise figure test equipment
   (b) Comparison of microwave amplifier and oscillator
   (c) 1dB compression point
   (d) Properties of scattering matrix.

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Sub :- SC   Q.P. Code : **2712**

(3 Hours) | Total Marks :100

N.B. : (1) Question No.1 is compulsory
(2) Attempt any **four** questions from questions No. 2 To 7.
(3) Assume suitable data wherever necessary and justify the same
(4) Draw neat sketches/diagrams wherever necessary.

1. Answer the following. (any four)
   (a) State and explain Kepler's laws? And show that $a_{G_{10}}$ = 42,000 km.   5
   (b) What is meant by polarization of satellite signals and why circular   5
       polarization is preferred in satellite applications?
   (c) Compare LEO, MEO, GEO satellites?   5
   (d) Briefly explain sun transit outage?   5
   (e) What are the differences between GEO Synchronous and GEO stationary   5
       orbits?

2. (a) Discuss design criteria and problems encounter by communication satellite   10
       and mention different sub systems of satellite?
   (b) Draw block diagram of transmit received earth station and explain each block?   10

3. (a) what is telemetry, tracking and command sub system? And explain it's   10
       working with necessary block diagrams?
   (b) Compare spin stabilization and 3- axis stabilization methods. Mention their   10
       advantages and disadvantages?

4. (a) Explain different types of double reflector antennas used in satellite   10
       communication?
   (b) Explain briefly importance of reliability, qualification and Bath tub curve?   10

5. (a) What are look angles? An earthstation is located at latitude 30⁰S and   10
       longitude 130⁰ E, calculate antenna look angles for satellite at 156⁰E?
   (b) Discuss different launching mechanism of satellite in GEO stationary orbit   10
       with necessary diagrams?

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6. (a) A satellite circuit has the following parameters: 10

	Uplink, decilogs	Downlink, decilogs
[EIRP]	54	34
[G/T]	0	17
[FSL]	200	198
[RFL]	2	2
[AA]	0.5	0.5
[AML]	0.5	0.5

Calculate the overall $[C/N_0]$ values.

(b) Why TWT is preferred for satellite communication and multiple careers operations? Explain 1 dB compression point? And what significant of this point in relation to operating point of TWT?   10

7. Write short notes on any **two**: -   20
    (a) Orbital perturbations with equations
    (b) Double conversion transformers
    (c) SPADE system
    (d) VSAT

[Total Marks : 100

(3 Hours)

N.B. : (1) Question no. 1 is compulsory
(2) Attempt **any four** questions from the remaining six questions.
(3) All questions carry **equal marks**.
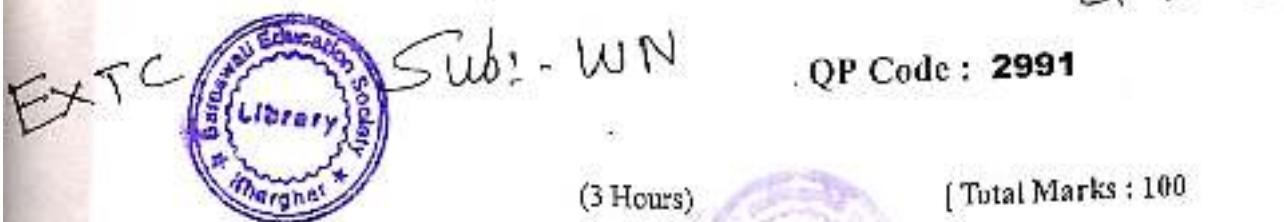(4) Assume suitable data if necessary and justify the same.

1. (a) Explain the three operating windows in optical communication. — 5
(b) What are direct and indirect bandgap semiconductor materials. — 5
(c) What is the significance of 'V' numbers. Write its equation in terms of N.A.(Numerical Apertur). — 5
(d) Explain bandwidth distance product. — 5

2. (a) Draw refractive index profile of graded index fiber. Explain how GRIN fiber has transmission bit rate higher than multimode step index fiber. — 10
(b) A silica optical fiber with one diameter large enough to be considered by ray theory has core refractive index of 1.5 and cladding refractive index of 1.47. Determine. — 10
   (i) The critical angle.
   (ii) The N.A.
   (iii) The acceptance angle.

3. (a) Explain any one fiber fabrication process with neat sketches. — 10
(d) What are the factors that are responsible for optical signal attenuation and dispersion during signal propogation through optical fiber. — 10

4. (a) Explain all aspects of link power budget and rise time budget — 10
(b) Give the structure of a surface emitting LED. Compare it with Edge emitting LED. — 10

5. (a) Describe two methods of splicing individual fibers together. What are the advantages and disadvantages of each method? — 10
(b) Discuss the operation of silicon RAPD. How it is different from PIN photodiode? — 10

6. (a) Explain the working of optical receiver with various noise sources. — 10
(b) A photodiode has a quantum efficiency of 65% when a photon of energy of $1.5 \times 10^{-19} J$ are incident upon it determine. — 10
   (i) At which wavelength is the photodiode operating
   (ii) Calculate the incident optical power required to obtain photocurrent of 2.5 μA when the photodiode operating as above.

7. Write short note on **any four** — 20
   (a) OTDR.   (b) Coherent and non- coherent optical transmission.
   (c) Linearly polarized modes.   (d) Multiplexing of optical signals.
   (e) Modal noise.

QP-Con. 11909-15. — — — — — — — —

EXTC Sub:- WN QP Code: 2991

(3 Hours) [Total Marks : 100]

N.B.: (1) Question No. 1 is **compulsory**
(2) Attempt any four out of remaining q.no. 2 to 7
(3) Draw neat Sketches wherever required.
(4) Assume suitable data if required.

1. (a) Why is power control is important in CDMA? 5
   (b) What is the difference between an BSS and a BSS in the IEEE 802.11? 5
   (c) Discuss two evolution paths for the GSM to offer 3G Services. 5
   (d) What is HSDPA? 5

2. (a) Differentiate between frequency hopping and direct-sequence spread spectrum. 10
   (b) What are various states in Bluetooth System? Explain difference between them. 10

3. (a) What is a WPAN? What is the difference between WPAN and WLAN? Name two example technologies for WPAN. 10
   (b) What is WAP? Discuss WAP architecture in brief. 10

4. (a) What is the UMTS? List important features of the UMTS air interface. 10
   (b) Discuss forward and reverse link channels in the cdma 2000 10

5. (a) Explain Bluetooth protocol stack 10
   (b) Explain sensor network protocol stack in detail. 10

6. (a) Explain link budget analysis and requirements of wireless networks. 10
   (b) Discuss WiMAX. What are the main differences between the IEEE 802.116 (Wi-Fi) and WiMAX? 10

7. Write short notes on
   (a) IEEE Project 802 10
   (b) RFID 10

QP-Con. 12121-15.