

**B. Tech. (EC) III Year, II Sem.**  
**ODD SEMESTER**  
**MINOR TEST 2017-2018**  
**OPERATION RESEARCH (BOE-03)**

Time: 2 Hrs

Note: Answer all questions.

- Q.1 Attempt any three parts of the following. Q.1 (a) is compulsory.
- (a) Write the dual of the problem

Max. Marks: 30

$$\begin{array}{ll}
 \text{Min} & Z = 3x_1 + x_2 \\
 \text{Subject to} & 2x_1 + 3x_2 \geq 2 \\
 & x_1 + x_2 \geq 1 \\
 \text{And} & x_1, x_2 \geq 0
 \end{array}$$

- (b) Define slack and surplus variables.

- (c) Write mathematical model of transportation problem.

- (d) A company has four plants  $P_1, P_2, P_3, P_4$ , from which it supplies to three markets  $M_1, M_2, M_3$ . Determine the optimal transportation plan from the following data giving the plan to market shifting costs, quantities available at each plant and quantities required at each market.

Market ↓	Plant				Required at market
	$P_1$	$P_2$	$P_3$	$P_4$	
$M_1$	19	14	23	11	11
$M_2$	15	16	12	21	13
$M_3$	30	25	16	39	19
Available at plant	6	10	12	15	43

- Q.2 Attempt any three parts of the following. Q.2 (a) is compulsory.

- (a) Prove that dual of the dual of a given primal is the primal.

- (b) Solve the programming problem by graphical method,

$$\text{Max. } Z = 8x_1 + 7x_2$$

$$\begin{array}{ll}
 \text{Subject to} & 3x_1 + x_2 \leq 66000 \\
 & x_1 + x_2 \leq 45000 \\
 & x_1 \leq 20000 \\
 & x_2 \leq 40000
 \end{array}$$

and

$$x_1 \geq 0, x_2 \geq 0.$$

- (c) A manufacturer of a line of patent medicine is preparing a production plan on medicines A and B. There are sufficient ingredients available to make 20000 bottles of A and 40000 bottles of B but there are only 45000 bottles into which either of the medicines can be put. Furthermore it takes 3 hours to prepare enough material to fill 1000 bottles of A it takes one hour to prepare enough material to fill 1000 bottles of B and there are 66 hours available for this operation. The profit is Rs. 8/- per bottle of A and Rs. 7/- per bottle of B. Formulate this problem as a Linear Programming Problem.

- (d) Solve the L.P. problem by simplex method

$$\begin{array}{ll}
 \text{Maximize} & Z = 3x_1 + 5x_2 + 4x_3 \\
 \text{Subject to} & 2x_1 + 3x_2 \leq 8 \\
 & 2x_2 + 5x_3 \leq 10 \\
 & 3x_1 + 2x_2 + 4x_3 \leq 15 \\
 \text{And} & x_1, x_2, x_3 \geq 0
 \end{array}$$

- Q.3 Attempt any three parts of the following. Q.3 (a) is compulsory.

- (a) Write transportation algorithm.

- (b) Define Assignment problem.

- (c) Give mathematical model for assignment problem.

- (d) What is the difference between transportation and an assignment problem?

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B. Tech.  
ODD SEMESTER  
MINOR TEST 2017 - 2018

## PRINCIPLES OF COMMUNICATION

Time: 2 Hrs.

Note: Answer all questions.

Max. Marks: 20

- Q.1** Attempt any Three parts of the following. Q. 1(a) is compulsory.
- (a). Explain Amplitude Modulation, theoretically as well as mathematically and Derive the relation between the output powers of AM transmitter and depth of modulation.
- (i) An AM Tx Current is given by 10A with modulation index 0.4, Find AM Tx Current with modulation index 0.8 ?
- (b). What is baseband and passband signals? Why is modulation of signal required for transmission over the channel?
- (c). Describe the frequency modulation (FM) and define the modulation index, deviation for FM?
- (d) The Signal given as  $x(t) = 5 \cos[2\pi \times 10^6 t + 2\sin 2\pi \times 10^4 t]$ , Find its
- (i) Instantaneous frequency at a time,  $t=0.25 \text{ ms}$
- (ii) Maximum frequency deviation
- (iii) Maximum phase deviation

- Q.2** Attempt any Two parts of the following. Q. 2(a) is compulsory.

- (a). Discuss the following method of generation of AM wave
- i) Square law modulator ii) switching modulator

- (b). Describe the generation of SSB by Filter Method. What are the advantages of SSB?

- (c). A non linear device is characterized by

$V_o = aV_i + bV_i^3$ ; where,  $V_i = m(t) + \cos 2\pi f_1 t$ . By considering only DSB Term from  $V_o$ , find  $f_1$ , such that the carrier frequency of the resulting DSB signal is 1MHz.

- Q.3** Attempt any Two parts of the following. Q. 3(a) is compulsory.

- (a). With the help of a circuit diagram, explain the working of a balanced slop detector for FM Demodulation. List any two advantages over a basic slope detector.

- (b). An FM Signal is given by

$$S_{FM}(t) = 10 \cos[2\pi \times 10^6 t + 8 \sin 4\pi \times 10^3 t]$$

- (i) Find  $\Delta f$ ,  $\beta$ , BW and Power
- (ii) Repeat above if message signal frequency is doubled.

- (c). Give equivalence relationship between FM and AM. List one advantage and one disadvantages of FM over AM.

B. Tech.  
ODD SEMESTER  
MINOR TEST 2017 - 2018

Subject Name: Electronics Measurement and Instruments

Time: 2 Hrs.

Max. Marks: 20

Note: Answer all questions.

- Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.
- (a). Define and explain the following static characteristics of an instrument :  
(1) Accuracy    (2) Precision  
(3) Sensitivity    (4) Resolution
- (b). Which are the various categories of LCDs based on the rod like molecule arrangement used.
- (c). Differentiate between primary and secondary transducers with the help of suitable Examples.
- (d). A strain gauge with resistance  $R = 700 \Omega$  and gauge factor 3.5. A Strain gauge connected with DC bridge and three other resistor  $700 \Omega$  each and bridge excitation of 5 volt if strain is subjected to  $200 \mu$  then what is the magnitude of bridge o/p.
- Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.
- (a). Define Absolute error and Limiting error of instrument. A 0-10 A ammeter has an accuracy of 1.5% of full scale reading. The current indicated by the ammeter is 2.5 A. Calculate the limiting values of current and percentage limiting error.
- (b). Define and explain Systematic error and Random error with examples.
- (c). The output voltage of an amplifier was measured at eight different intervals using the same digital voltmeter with the following results: 20.00, 19.80, 19.85, 20.05, 20.10, 19.90, 20.25, 19.95 V. Calculate 1) Deviation of each value and 2) Standard deviation.
- Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.
- (a). Describe the construction and working of L.V.D.T. with neat sketches. Explain its various performance characteristic.
- (b). A strain gauge with a gauge factor of 2 is faster to a stress of  $10.5 \times 10^4 \text{ KN/m}^2$  If the modulus of elasticity of steel is  $2.1 \times 10^8 \text{ KN/m}^2$  then what is the change of resistance due to stress in the strain gauge.
- (c). Give working principle, characteristics of following transducers: 1) Capacitive Transducer 2) Piezoelectric.

Analog Integrated Circuits

Time: 2 Hrs.

Max. Marks: 20

Note: Answer all questions.

Q.1

Attempt any Three parts of the following. Q. 1(a) is compulsory.

- (a). Draw a circuit of a differential amplifier with a constant current source. Explain how a constant current source used in place of an emitter resistor  $R_E$  improves the CMRR of a differential amplifier.
- (b). Derive the expression for voltage gain of a dual input balanced output differential amplifier and also draw its input and output voltage waveforms.
- (c). Sketch output waveform  $V_o$  of following circuit shown in figure 1 corresponding to a sinusoidal input  $V_i$  and explain its operation.

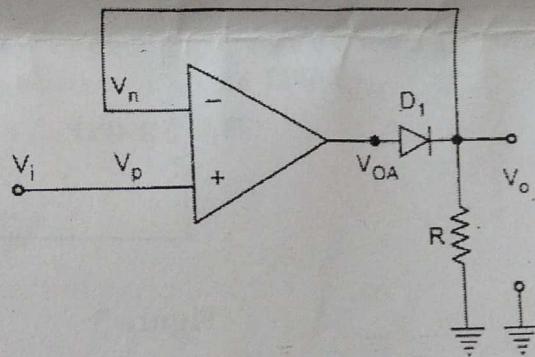


Figure 1.

- (d) Compare the inverting and non-inverting comparators using input and output voltage waveforms.

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

- (a). The figure 2 shows the circuit diagram of a Widlar current source. Determine the value of  $R_E$  to adjust  $I_{C1}=10 \mu A$ .

15c

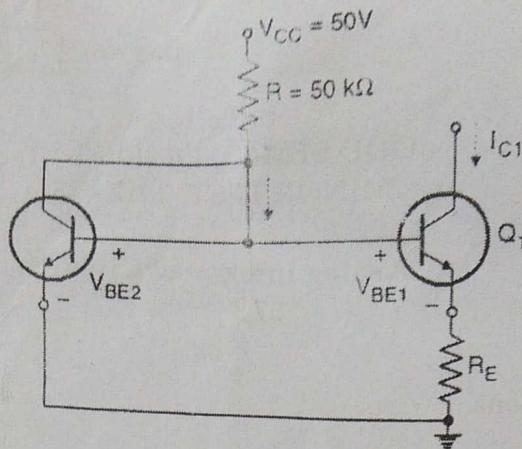


Figure 2

- (b). Sketch out the circuit diagram of Wilson current source and prove that the ratio of output current to reference current in Wilson current source is less sensitive to  $\beta$ . 2
- (c). What is a Current Mirror Circuit? Determine the constant current I in the circuit shown in Figure 3. 2

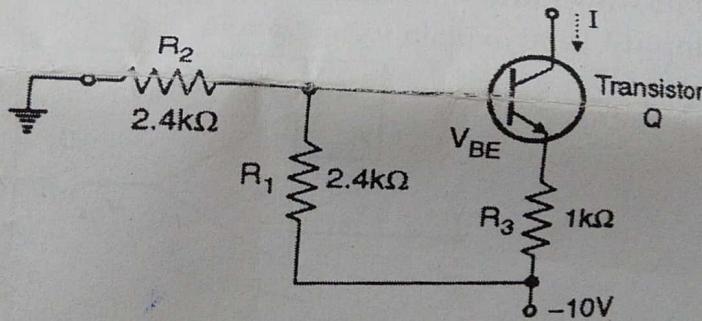


Figure 3

Q.3 Attempt any Two parts of the following. Q. 3(a) is compulsory.

- (a). Draw a full wave Precision rectifier circuit and explain its operation with the help of waveforms. 4
- (b). Draw a circuit of Log amplifier using an Op-Amp. Derive its output expression also. 2
- (c). Draw and explain the operation of Sample and Hold circuit using Op-Amp. 2

B. Tech.  
ODD SEMESTER  
MINOR TEST 2017 - 2018

Subject Name : Control System

Time: 2 Hrs.

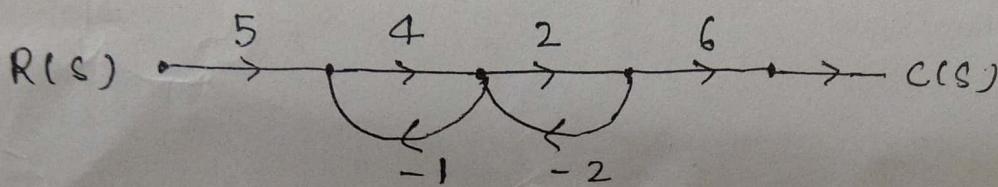
Max. Marks: 20

Note: Answer all questions.

Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.

(a).

The signal Flow Graph of a particular system is given in below figure and obtains Gain for the system using Mason Gain Formula?



(b).

Write down the comparison between Signal flow graph and Block Diagram method? Write down at least five key points for comparison? 2

(c).

A system is described by following matrix-

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \quad B = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 2 & 0 \end{bmatrix}$$

Determine transfer function?

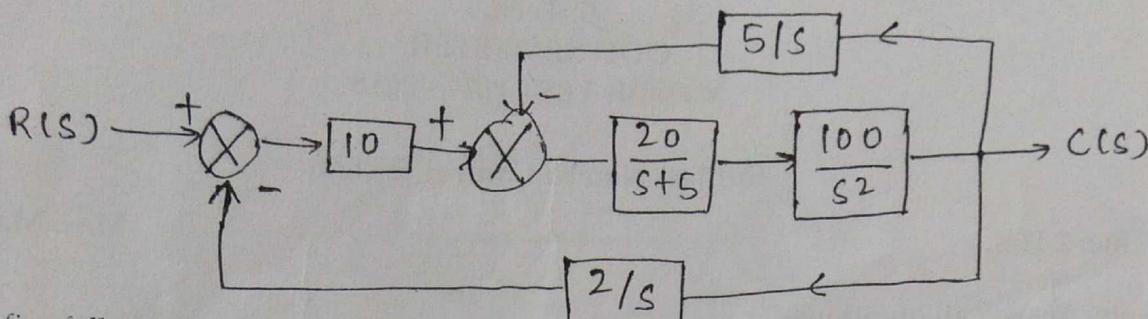
(d)

Write down the properties of State Transition matrix and also write at least five advantage of STM ?

Q.2 Attempt any Two parts of the following. Q. 2(a) is compulsory.

(a).

For the block diagram of the system determine the transfer function using Block Diagram Reduction technique in steps?



(b).

Define following terms?

2

- (i) Input signal
- (ii) Forward path
- (iii) Feedback path
- (iv) Feedback signal
- (v) Error signal

(c).

What do you mean by Signal Flow Graph Algebra and also least five properties of Signal Flow Graph?

2

**Q.3** Attempt any Two parts of the following. Q. 3(a) is compulsory.

(a).

Find the State equation and Output equation for the system by using phase variable method.

4

$$\frac{y(s)}{U(s)} = \frac{s^3 + 5s^2 + 6s + 1}{s^3 + 4s^2 + 3s + 3}$$

(b).

Prove that the transfer function for Non Homogenous system is given by -

2

$$\frac{y(s)}{U(s)} = C(SI - A)^{-1}B + D$$

(c).

Define controllability and Observability for the MIMO system? Write down the criteria for Controllability and Observability?

2

B.Tech. – V Sem. CE/CSE/ECE/EE/ME  
ODD SEMESTER

MINOR TEST 2017-2018

Engineering and Managerial Economics

Max. Marks: 30

Max. Time: 02 hrs

Note: Answer all questions.

**Q.1 Attempt any Three parts of the following. Q. 1(a) is compulsory.**

- a) To resolve the three basic economic problems of what, how and for whom to produce, what are the areas of micro and macro economics that a manager should be familiar with? (4)
- b) How are microeconomics and macroeconomics related to the managerial economics? Analyze. (3)
- c) Law of demand is qualitative statement while elasticity of demand is quantitative statement. Explain (3)
- d) What is price elasticity of demand? How can it be useful in firm's strategy formulation for raising its sales? (3)

**Q.2 Attempt any Three parts of the following. Q. 2(a) is compulsory.**

- a) What is the role of decision sciences in managerial decision making? Explain the various types of business decisions that managers have to make. (4)
- b) What is the difference between microeconomics and macroeconomics? What are the three main goals of macroeconomics? (3)
- c) Define nature and scope of managerial economics. How is managerial economics linked with pure economics? (3)
- d) How does a firm make use of the managerial economics to (3)
  - (a) Decide on the price of the product.
  - (b) Estimate the demand for the product.

- Q.3 Attempt any Three parts of the following. Q. 3(a) is compulsory**
- a) What is supply? What are the factors which influence the supply? Analyze the supply function and the supply curve. (4)
  - b) A soft drink firm developed a soft variety of the cola drink and wanted to know the consumer response to the product. It tested the product in Delhi market area. It was a resounding success, 90 % consumers preferred to its hard variety. The company got encouraged and launched it nationwide. Within a month it realized that the product has been rejected in the market and the soft variety had to be withdrawn. Where did the firm go wrong? (3)
  - c) What is time-series data? What are possible sources of variation in time-series data? Why does time series analysis deal primarily with trend and seasonal variation rather than with cyclical and irregular or random variations? (3)
  - d) Derive the demand schedule and curve based on the law of demand. What are the factors affecting demand for a commodity. (3)

**B. Tech. III  
ODD SEMESTER  
MAJOR EXAMINATION 2017 - 2018**

**Operation Research**

**Time: 3 Hrs.**

**Note: Attempt all questions. Each question carry equal marks.**

**Max. Marks: 50**

**1. Attempt any four parts of the following:**

**(4 × 2.5 = 10)**

**(a) Solve the following problem by graphically:**

Maximize  $z = x - 3y$  subject to conditions

$$x + y \leq 300, x - 2y \leq 200, 2x + y \geq 100, y \leq 200, x, y \geq 0.$$

**(b) Consider the problem:  $\text{Min } z = x_1 - 3x_2 + 2x_3$ , subject to,**

$$3x_1 - x_2 + 3x_3 \leq 7, -2x_1 + 4x_2 \leq 12, -4x_1 + 3x_2 + 8x_3 \leq 10.$$

and  $x_1, x_2, x_3 \geq 0$ . Solve this linear Problem.

Solve for optimum basic feasible solution to the following **assignment** problem in which cell entries represent unit costs

		Jobs				
		I	II	III	IV	V
Machines	A	11	10	18	5	9
	B	14	13	12	19	6
	C	5	3	4	2	4
	D	15	18	17	9	12
	E	10	11	1	6	14

**(d) Solve the given LP problem by dual simplex method:  $\text{Min } z = 3x_1 + x_2$  subject to**

$$x_1 + x_2 \geq 1, 2x_1 + 3x_2 \geq 2, x_1, x_2 \geq 0.$$

**(e) Solve the following transportation table using Vogel's approximation method.**

							Available
							5
							6
9	12	9	6	9	10		5
7	3	7	7	5	5		6
6	5	9	11	3	11		2
6	8	11	2	2	10		9
Require	4	4	6	2	4	2	

(f) Give the dual of LP problem:  $\text{Min } z = 3x_1 + 4x_2 + 5x_3$ , subject to the constraints:

$$3x_1 + 4x_2 + 5x_3 \geq 3, \quad 4x_1 + 2x_2 + 8x_3 = 3, \quad x_1 + 4x_2 + 6x_3 \leq 5.$$

$x_1, x_2 \geq 0$  and  $x_3$  is unrestricted.

Attempt any two parts of the following:

(a)

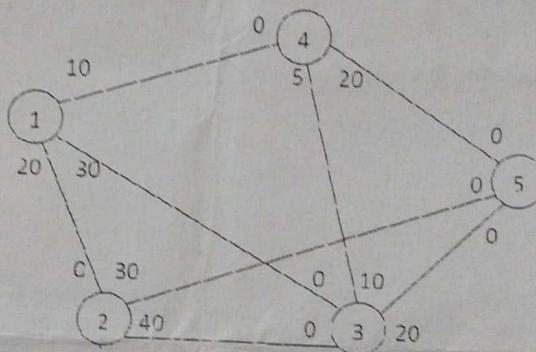
A project schedule has the following characteristics:  $(2 \times 5 = 10)$

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

- (i) Construct a network diagram
- (ii) Compute the total float, free float and independent float for each activity.
- (iii) Find the critical path and total project duration.

(b)

Determine the maximal flow from source 1 to destination 5 for the network shown in given below figure



- (c) The national park service plans to develop wilderness areas for tourism. Four locations in the area are designed for automobile access. These sites and distances (in miles) between them are listed in given below table. To inflict the least harm on the environment, the park service wants to minimize the miles of roadway required to provide the desired accessibility. Determine how roads should be built to achieve this objective.

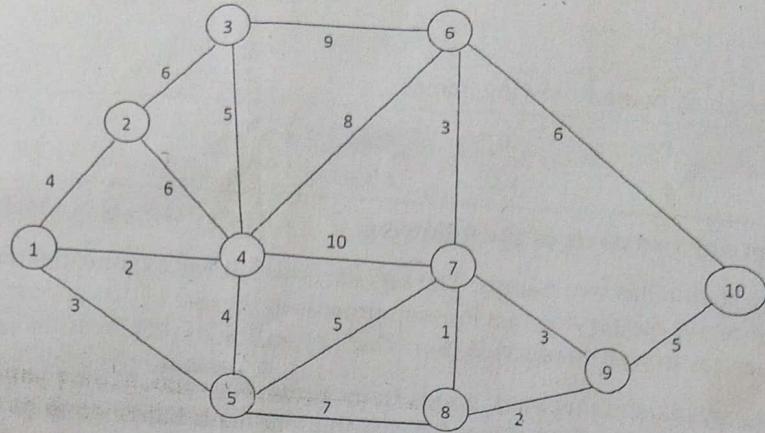
	Park entrance	Wilds falls	Majestic rock	Sunset point	The meadow
Park entrance (P)	-	7.1	19.5	19.1	25.7
Wilds falls (W)	7.1	-	8.3	16.2	13.2
Majestic rock (M)	19.5	8.3	-	18.1	5.2
Sunset point (S)	19.1	16.2	18.1	-	17.2
The meadow(T)	25.7	13.2	5.2	17.2	-

Attempt any two parts of the following:

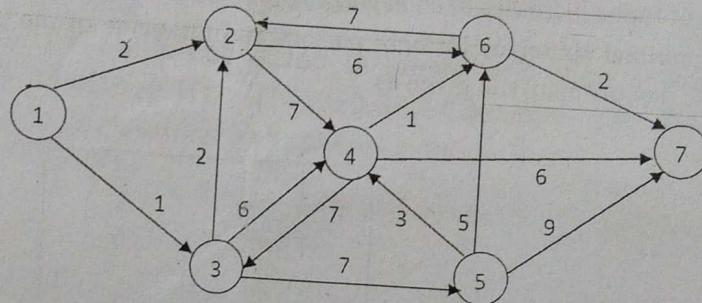
$(2 \times 5 = 10)$

(a)

Find the minimum spanning tree of the network given below:



- (b) Determine the shortest route between node 1 and every other node in the network given below:



- (c) Explain the terms (i) Minimum spanning tree problem (ii) Max-flow Problem (iii) Difference between CPM and PERT (iv) Guidelines of network construction.  
(1+1+1+2)

4.

Attempt any two parts of the following:

- (a) Solve game by Simplex method of linear programming whose pay off matrix is given below  $(2 \times 5 = 10)$

$$\begin{bmatrix} -1 & 2 & 1 \\ 1 & -2 & 2 \\ 3 & 4 & -3 \end{bmatrix}$$

- (b) Two Competitors A and B are competing for the same product. Their different strategies are given in the following pay off matrix

		Competitor B				
		B1	B2	B3	B4	B5
Competitor A	A1	4	4	2	-4	-6
	A2	8	6	8	-4	0
	A3	10	2	4	10	12

Use dominance principle to find the optimal strategies.

(c)

Solve graphically the following games

2	-4	6	-3	5
-3	4	-4	1	0

5.

Attempt any two parts of the following:

(2 × 5 = 10)

- (a) A petrol station has two pumps. The service time follows exponential distribution with mean 4 minutes and cars arrive for service in a Poisson process at the rate of 10 cars per hour. Find the probability that a customer has to wait for service. For what proportion of time does the pump remain idle?
- (b) In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to hump a train) distribution is also exponential with an average 36 minutes. Calculate the following:
- The average number of trains in the queue.
  - The probability that the queue size exceeds 10.

If the input of trains increases to an average 33 per day, what will be change in (i) and (ii)?

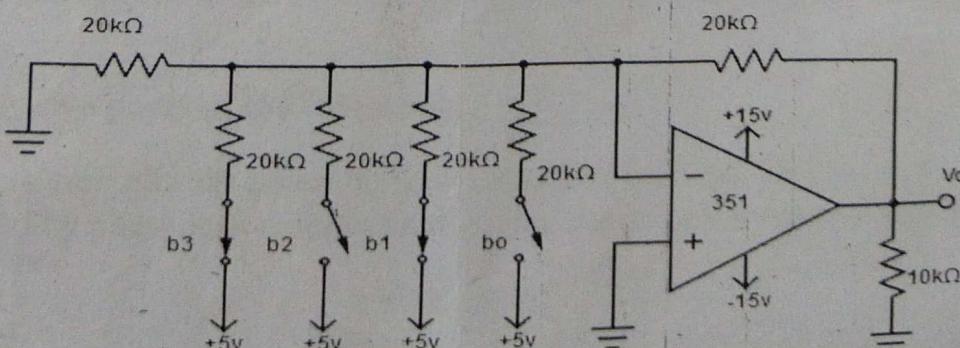
(c) Obtain the optimal strategies for both persons and the value of the game for two persons zero - sum game whose pay off matrix is given as

1	-3
3	5
-1	6
4	1
2	2
-5	0

B. Tech.  
 ODD SEMESTER  
 MAJOR EXAMINATION 2017 - 2018  
 ELECTRONIC MEASUREMENT & INSTRUMENTATION

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks. Max. Marks: 50

1. Attempt any four parts of the following:  $(4 \times 2.5 = 10)$
- Explain the different types of error that may occur in measurements.
  - How does the spectrum analyser works and what are its applications?
  - The R.M.S. current passing through a resistor of  $120 \pm 0.5$  ohm is  $2 \pm 0.02$  A. Calculate the limiting error in the value of power dissipation.
  - Two resistors  $R_1$  and  $R_2$  are connected in series and then in parallel values of resistance are:  $R_1 = 100.0 \pm 0.1\Omega$ ,  $R_2 = 50 \pm 0.03\Omega$ . Calculate the uncertainty in the combined resistance for both series and parallel arrangements.
  - Define the term flow rate. Explain the working principle of a magnetic flow meter. What are its limitations?
  - Explain the term loading in voltmeter and how it is removed? Draw the block diagram of dual slope type digital voltmeter and explain its working.
2. Attempt any two parts of the following:  $(2 \times 5 = 10)$
- What is Data acquisition system? Explain with a block diagram the operation of a multichannel Data acquisition system using digital multiplexing.
  - Explain with a circuit diagram, Analog to digital converter (A/D) and Digital to analog (D/A) converter using OPAMP. State the advantages of using an OPAMP in a D/A converter.
  - Explain with block diagram the operation of a Data Logger. State the functions of each block.
3. Attempt any two parts of the following:  $(2 \times 5 = 10)$
- Explain the basic concept of data transmission? Describe with a block diagram a basic data transmission system? Write the advantage and disadvantage of digital transmission over analog.
  - 

i) For the given above circuit find the output voltage?

ii) A 10-bit D/A converter have an output range from 0-9V. Calculate the output voltage produced when the input binary number is 1110001010.

- (c) For a 5 bit resistive divider, determine the following (i) the weights assigned to the LSB (ii) the weight assigned to the 2<sup>nd</sup> and 3<sup>rd</sup> LSB. (iii) the change in output voltage due to the change in the LSB, 2<sup>nd</sup> LSB and 3<sup>rd</sup> LSB (iv) the output voltage for a digital input of 11011 and 10110 (Assuming 0=0V and 1=+10V)

4. Attempt any two parts of the following: (2× 5 = 10)

(a) Explain with diagram the operation of a bolometer bridge for measurement of power. A small AF voltage of 20V is superimposed on the RF test power and balance is achieved. If the RF test power is now turned off, 30 V AF is required to balance the bridge. If the bridge arms has a resistance of  $100\Omega$ . Calculate the RF test power.

(b) Explain with diagram the operation of an unbalanced bolometer bridge and self-balancing bolometer bridge. State its advantages and disadvantages.

(c) Explain with a diagram, measurement of power in a lossy cable using calorimetric method.

Calculate the power radiated by a transmission line having the following parameters, mass is 200 gm, Specific heat of water=1 cal/gm°C, Initial temperature is 30°C and final temperature is 40°C.

5. Attempt any two parts of the following: (2× 5 = 10)

+ (a) Explain with neat diagram how coaxial line resonator is formed. What is meant by cavity resonator?

(b) Describe with a diagram the operation of ramp type DVM. State limitations of a ramp type DVM and how it is overcome.

(c) Two identical 30 dB directional couplers are used to sample incident and reflected power in a waveguide. The value of VSWR is 6 and the output of the sampling incident power is 5mw. What is the value of reflected power?

B. Tech.  
ODD SEMESTER  
MAJOR EXAMINATION 2017 - 2018

Control Systems

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

Max. Marks: 50

**1. Attempt any four parts of the following:**

$(4 \times 2.5 = 10)$

- (a) Explain the elements of automatic control system with a suitable block diagram.
- (b) Explain in brief the requirements of automatic control system.
- (c) Derive the expression of sensitivity of overall transfer function with respect to the feedback element H.
- (d) A system having transfer function  $H(s) = \frac{1}{s+3}$  is forced with  $10u(t)$ . Find the time at which the output reaches to 91 and 95 percent respectively of its steady state value.
- (e) Show that how an unlike integrator controller ensure the stability of the system.
- (f) Check the controllability and observability of the system having following state variable equations.

$$\dot{X}_1 = -3X_1 - X_2 + U$$

$$\dot{X}_2 = 2X_1$$

$$Y = X_1 + U$$

2.

**Attempt any two parts of the following:**

$(2 \times 5 = 10)$

- (a) Derive the transfer function for the second order under damped system and hence find the expression for  $M_p$ ,  $T_p$  and  $T_r$ .
- (b) Find the gain margin of the system under closed loop unity negative feedback in dB.

$$G(s)H(s) = \frac{80}{s(s+20)(s+20)}$$

- (c) The unit impulse response of an LTI system is the unit step function  $u(t)$ . For  $t > 0$ , find the response of the system to an excitation  $e^{3t}u(t)$  and also calculate the steady state value of the response.

**Attempt any two parts of the following:**

$(2 \times 5 = 10)$

- (a) Draw the pole zero plot for phase lag and phase lead network. Determine the maximum phase shift provided by phase lead compensator having the given forward path transfer function

$$G(s) = \frac{1+6Ts}{1+Ts}$$

- (b) Draw the magnitude and phase response of the following system.

$$G(s)H(s) = \frac{K}{s} e^{-st}$$

- (c) Determine the system parameter 'p' of a system having transfer function  $\frac{Y(s)}{X(s)} = \frac{s}{s+p}$  and output  $Y(t) = \cos(2t - \frac{\pi}{2})$ .

4.

**Attempt any two parts of the following:**

(2 × 5 = 10)

- (a) A system has a transfer function of  $G(s)H(s) = \frac{3}{s(s+2)} e^{-2s}$ . Determine the gain crossover frequency, phase crossover, gain margin and phase margin of the system.
- (b) A unity feedback system having  $G(s) = \frac{K}{s(s+a)}$ , resonant peak  $M_r = 1.04$  and resonant frequency = 11.55 rad/sec. Determine the value of 'K' and 'a' and also calculate the bandwidth of the system.
- (c) Sketch the Nyquist plot of a unity feedback system having open loop transfer function  $G(s) = \frac{K}{s(s+1)(1+2s)(1+3s)}$ . Also determine the range of K for which the system is stable.

5.

**Attempt any two parts of the following:**

(2 × 5 = 10)

- (a) Explain the effect of adding a zero and a pole to the forward path.
- (b) A unity negative feedback system has an open loop transfer function consisting of two poles at -0.1 and 1 and two zeros at -2, and -1 with a variable gain K. Determine the range of K for which the closed loop system has two poles in the right hand side.
- (c) A feedback system has characteristic ~~equation given by~~ *polynomial*  $S^4 + 20ks^3 + 5s^2 + 10s + 15$

Comment on stability for all value of k using RH criteria.

B. Tech.  
ODD SEMESTER  
MAJOR EXAMINATION 2017 - 2018  
PRINCIPLES OF COMMUNICATION

Time: 3 Hrs.

Note: Attempt all questions.

1. Attempt any four parts of the following: Max. Marks: 50

- (a) Draw the circuit diagram for ring modulator for generating DSB-SC AM signal and explain its working.  $(4 \times 2.5 = 10)$
- (b) Explain the working of envelope detector. An audio signal of bandwidth 5 kHz is modulated on carrier frequency 1MHz using conventional AM. Determine range of values of RC for successful demodulation of this signal using an envelope detector.
- (c) Why do you need pre-emphasis and de-emphasis? Explain.
- (d) What are the two types of non-uniform quantization? Discuss in detail.
- (e) A carrier signal of  $10 \cos(4\pi \times 10^6 t)$  is DSB modulated by a message signal of  $6 \cos(6\pi \times 10^4 t) + 8 \cos(\pi \times 10^5 t)$ , find all the parameters of DSB and plot the spectrum.
- (f) A phase modulated signal is given by  $s_{PM}(t) = 10 \cos\{2\pi \times 10^6 t + 6\sin(6\pi \times 10^3 t)\}$   
 (i) Find all the parameters of PM (ii) repeat above if message signal for equation is doubled.

2.

Attempt any two parts of the following:

- (a) Explain the following (i) Shot noise (ii) Equivalent Noise temperature.  $(2 \times 5 = 10)$

(b) How do you represent a narrowband noise in terms of in-phase and quadrature component?

(c) Explain the noise performance in AM receivers and derive the figure of merit.

3.

Attempt any two parts of the following:

$(2 \times 5 = 10)$

- (a) What do you mean by the term noise used in communication system? Discuss the different type of noise sources? What are various noises present in Frequency Modulation?

(b) What is linear filtering of noise? Discuss the effect of various filters on noise.

- (c) Two resistors of  $20 \text{ k}\Omega$  and  $50 \text{ k}\Omega$  are at room temperature of  $290 \text{ K}$  for a given bandwidth of  $100 \text{ Hz}$ . Determine the thermal noise voltage generated by (i) each resistor (ii) Two resistor in parallel (iii) Two resistor in series.

4.

Attempt any two parts of the following:

$(2 \times 5 = 10)$

- (a) Explain the generation and detection of FSK signal with block diagram? Draw the ASK, PSK and FSK waveforms for digital data 10100110.

- (b) What is quantization? How can you minimise the quantization error? How quantizing and coding is done? Explain with suitable diagram.
- (c) What are the various pulse modulation techniques? Explain how PPM is obtained from PWM.

**Attempt any two parts of the following:**  $(2 \times 5 = 10)$

- (a) Consider a binary sequence with a long sequence of 1s followed by a single 0 and then a long sequence of 1s. draw the waveform of this sequence, using the following signaling formats

- (i) Unipolar NRZ signaling
- (ii) Bipolar NRZ signaling
- (iii) AMI RZ Signaling
- (iv) Split Phase

- (b) What is multiplexing in communication systems? Draw the block diagram of frequency division multiplexing to transmit five signals.

- (c) What are the various noises present in PCM system? A message signal of  $8 \sin(8\pi \times 10^3 t)$  is transmitted through PCM system, sampling rate is 50% higher than nyquist rate and minimum SQNR should be 22dB. Find (i) transmission Bandwidth (ii)  $(SQNR)_{dB}$ .

B. Tech.  
(SEM V) ODD SEMESTER  
MAJOR EXAMINATION 2017 - 2018

Subject Name: Engineering and Managerial Economics

Max. Marks: 50

Time: 3 Hrs.

Note: Attempt all questions. Each question carry equal marks.

1. Attempt any four parts of the following:

- (a) What are the crucial business decisions that a firm has to make? How can a firm apply the managerial economics in making these decisions? Discuss.  
(b) Describe the application of tools, techniques and concepts of managerial economics in our engineering career.  
(c) Explain the nature of business decision making problem. Explain the meaning of business strategy in this context. What criteria does manager of a business firm often follow in choosing a strategy?  
(d) State the law of demand. What are the factors which determine market demand for a commodity?  
(e) Explain the concept of income elasticity of demand. Explain the importance of income elasticity of demand for a business firm, especially in designing marketing strategies?  
(f) Why is demand forecasting essential? What is the Delhi method? What is the use of this method in demand forecasting?

(4×2.5 = 10)

2. Attempt any two parts of the following:

- (a) Distinguish between short-run and long-run production functions. Explain the law of increasing returns to scale.  
(b) Define cost function. Explain the concept of total fixed cost, total variable costs and total costs.  
(c) What is opportunity cost? Give some examples of opportunity cost. How are these costs relevant for managerial decisions?

(2×5 = 10)

3. Attempt any two parts of the following:

- (a) Define marginal cost. How is it related to marginal product of a factor? As output is increased, marginal cost first falls and then beyond a certain point it rises. How would you explain it?  
(b) What are the three stages of production function? Why does it not make any economic sense to produce in stage 1 or stage 3?  
(c) What do you understand by theory of profit? Explain any two theories of profit.

(2×5 = 10)

4. Attempt any two parts of the following:

- (a) What is meant by business cycles? What are the different phases of a business cycle? How is private business affected during the different phases?  
(b) What are the characteristic of perfect competition? Why is a firm under perfect competition a price-taker and not a price-maker?  
(c) "The monopolist produces a larger output at a lower price and earns larger profits in the long run than it does in the short run". Comment.

(2×5 = 10)

5. Attempt any two parts of the following:

- (a) Which are the three approaches for calculating the GDP? Discuss.  
(b) Discuss the concept of Inflation and Deflation. How do they effect the level of economic activity?  
(c) Discuss the characteristics of oligopoly? What are the causes of oligopoly?

B. Tech.  
ODD SEMESTER  
MAJOR EXAMINATION 2017 - 2018

## Analog Integrated Circuits

Time: 3 Hrs.

Note: Attempt all questions. Each question carries equal marks.

Attempt any four parts of the following:

Max. Marks: 50

1. (a) Derive the expression for common mode voltage gain of a dual input balanced output differential amplifier.  $(4 \times 2.5 = 10)$
- (b) Sketch out the circuit diagram of a Widlar current source and also explain why it is known as current lens.
- (c) In Fig. 1, a transistor array CA3086 is used and  $\beta_{dc} = \beta_{ac} = 100$  and  $V_{BE} = 0.715$  V. Find the collector current of each transistor.

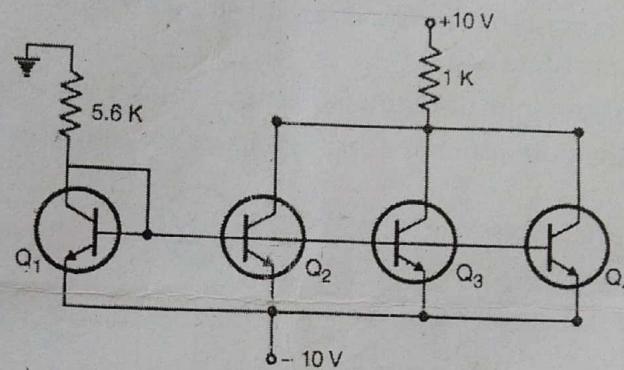


Fig. 1

- (d) Sketch out the output waveform  $V_o$  in the Fig. 2 shown below for a given sinusoidal input signal  $V_{in}$  such that  $|V_{in, max}| > V_{ref} > 0$ ,

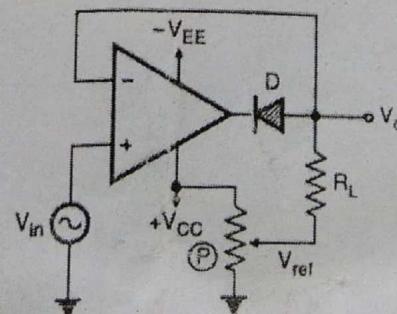


Fig. 2

- (e) Explain the working of an antilog amplifier with the help of its circuit diagram.

- (f) With the help of circuit diagram and waveforms, explain the operation of a zero crossing detector.

2. Attempt any two parts of the following:  $(2 \times 5 = 10)$

- (a) Determine the frequency response of a Sallen & Key second order Op-amp based low pass filter.

(b) Explain the working of a non-inverting Schmitt Trigger with a suitable circuit diagram and relevant waveforms.

(c) For an Op-amp based first order Butterworth low pass filter, calculate the cut-off frequency if  $R=10\text{ k}\Omega$  and  $C=0.001\mu\text{F}$ . Also calculate the passband voltage gain if  $R_{in}=10\text{ k}\Omega$  and  $R_F=100\text{ k}\Omega$ .

3.

Attempt any two parts of the following:

( $2 \times 5 = 10$ )

(a) Design a wide bandpass filter for  $f_L=100\text{Hz}$  and  $f_H=1\text{KHz}$  and passband gain=4. Also calculate the value of its quality factor Q. Assume data suitably.

(b) Explain the working of an Op-amp based monoshot multivibrator with the help of a circuit diagram and waveforms.

(c) Describe the operation of a bandstop filter in brief.

4.

Attempt any two parts of the following:

( $2 \times 5 = 10$ )

(a) Explain the working of an Astable multivibrator using 555 timer IC using circuit diagram and waveforms suitably.

(b) Design a monostable multivibrator using 555 timer to produce a pulse width of 1 msec. Assume data suitably.

(c) Determine the range of regulated output voltage  $V_o$  which can be obtained by adjusting the potentiometer through its entire range as shown in the fig. 3.

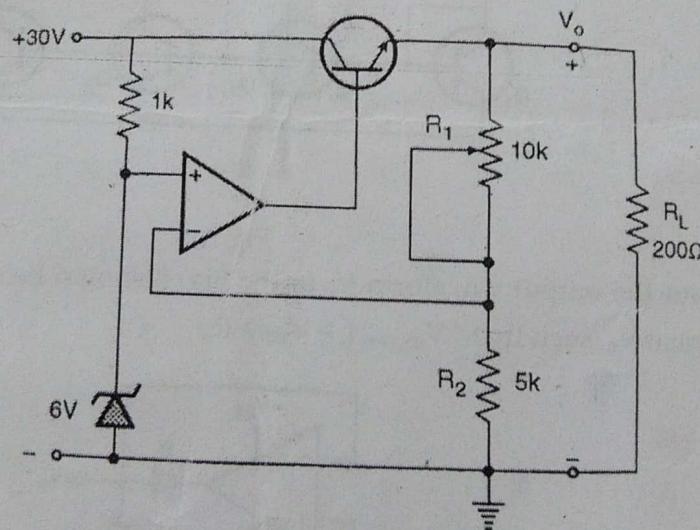


Fig. 3

5. Attempt any two parts of the following: ( $2 \times 5 = 10$ )

(a) Draw block diagram of a PLL and explain its operation in detail.

(b) Design an astable multivibrator using IC 555 timer with the following specifications: output frequency  $f_o=5\text{KHz}$  and the duty cycle of output voltage waveform is 60%. Assume data suitably.

(c) Explain the operation of a series regulator using Op-amp with the help of a circuit diagram in detail.