



kIkl Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

ENDSEMESTER

Program: Electrical Engg

Duration: 3 hr.

Maximum Marks: 100

Name of the Course: **ELEMENTS OF POWER SYSTEM**

Date: MAY 2018

Course code: BTE229

Semester: IV

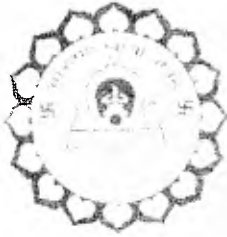
Instructions:

- Question number 1 is compulsory
- Solve any 4 questions from remaining 6 questions
- Assume suitable data if necessary give justifications for the same
- Marks division is indicated in brackets

Question No.	Question	Max points	CO No	Mod No.
Q1)	a) With the help of graph explain which factors affect the resistivity of soil used as earth pit.	6	3	6
	b) Explain skin effect	6	2	7
	c) Explain string efficiency of insulator string. Why AC transmission system doesn't have 100% string efficiency? Name the methods used to improve the string efficiency.	6	2	5
	d) Why high voltage transmission is done?	2	1	1
Q2)	a) A 400K, 3 phase bundled conductor line with two subconductors per phase has a horizontal configuration as shown in fig. The radius of each subconductor is 1.6cm. a) Find the inductance per phase per km of the line, b) Compute the inductance of the line with only one conductor per phase having the same crosssectional area of the conductore of each phase.	12	2	3

The diagram shows a horizontal arrangement of three phases: a, b, and c. Each phase consists of two subconductors. The subconductors for phase a are labeled 'a' and 'a'' and are separated by 45 cm. Similarly, the subconductors for phase b are labeled 'b' and 'b'' and are separated by 45 cm. The subconductors for phase c are labeled 'c' and 'c'' and are separated by 45 cm. The horizontal distance between the centerlines of the three phases (a, b, and c) is 12 m.

	b)	A 220 KV, 50Hz, 200km long 3 phase line has its conductors on the corners of a triangle with sides 6m, 6m, and 12m. The conductor radius is 1.81 cm. Find the capacitance per phase per km, capacitance reactance per phase and charging current	8	2	3
Q3)	a)	A 300 MVA, 20kV three phase generator has a sub transient reactance of 20%. The generator supplies two synchronous motors over a 64 KM transmission line having transformers at both the ends as shown. The motors rated 13.2 kV. Rated inputs to the motors are 200 MVA and 100 MVA for M1 and M2 respectively. For both the motors $X''=20\%$. The 3 phase transformer T1 is rated 350 MVA, 230/20 kV with leakage reactance of 10%. The transformer T2 is composed on three single phase transformers each rated 127/13.2 kV, 100 MVA with leakage reactance of 10%. Series reactance of transmission line is 0.5 ohm/km. Draw the reactance diagram with all reactances marked in per unit. Select the transmission line voltage as a base voltage and 300 MVA as base MVA.	10	2	4
	b)	If the motors M1 and M2 of above problem have inputs of 120 MW and 60 MW respectively at 13.2 kV and both operate at unity power factor, find voltage at the terminals of generator.	10	2	4
Q4)	a)	Discuss the phenomenon of corona. Discuss the factors which affect corona and methods to reduce corona effect.	10	1	3
	b)	3 phase, 220KV, 50Hz transmission line consists of 1.5cm radius conductor spaced 2 meters apart in equilateral triangular formation. If the temperature is 40°C and atmospheric pressure is 76cm, calculate the corona loss per km of the line. Take irregularity factor as 0.85.	10	1	3
Q5)	a)	Consider two AC sources are connected by a line, analyze transfer of real and reactive power when a) Power angle difference between two sources is zero b) Power angle difference between two sources is there	12	2	5
	b)	With the help of neat phasor diagram explain Ferranti effect.	8	2	5



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REEXAMINATION

Program: Electrical Engg

Duration: 3 hrs.

Maximum Marks: 100

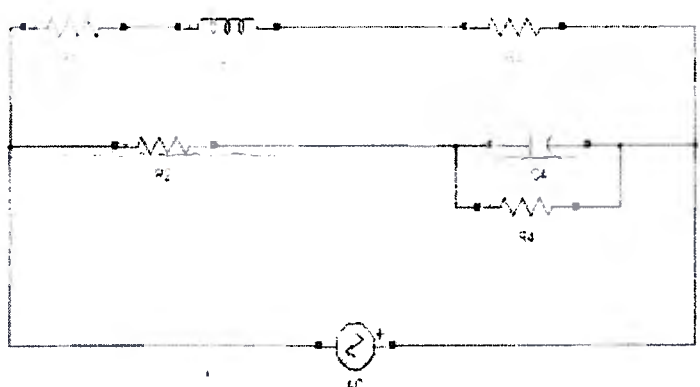
Date: JUNE 2018

Course code: BTE228

Semester: IV

- Name of the Course: Electrical and Electronic measurements
- Solve any 5 questions

Q.No.	Questions	Max Marks
Q1) a)	In a 6-bit successive approximation converter, if full scale value represents 1 V and the unknown voltage $V_x = 57/64$ Volts. Find the various V_n to measure V_x . Plot V_n versus n .	15
b)	Write a note on voltage ratio meter using VTC.	5
b)	With the help of neat diagram explain high frequency measurement using PLL.	20
c)	Explain with neat diagram the measurement of 'Peak frequency'	10
Q3)a)	What issues come across low frequency measurement? With the help of connection diagram and waveforms explain 'fast low frequency measurement'.	12
b)	With the help of diagram and balance equations explain 'Maxwell's inductance bridge'.	8
Q4)a)	A current transformer has bar primary and 300 secondary winding turns. The secondary winding resistance and reactance are 1.5Ω and 1.0Ω respectively including the transformer winding. With 5 A flowing in the secondary winding, the magnetizing mmf is 100A iron loss is 1.2 W.	15

	Determine the ratio and phase angle error.	
b)	Explain digital capacitance meter using ratio metric measurement.	5
Q5)a)	What is thermocouple effect? Where this effect is used? What is 'cold junction compensation'? Write a note on Thermocouple.	10
b)	Explain electrical tachometer with the help of neat diagrams.	10
Q6)a)	With the help of diagram and balance equations explain 'Wheatstone bridge'.	8
b)	A Maxwell's capacitance bridge shown below is used to measure an unknown inductance in comparison with capacitance. The various values at balance, $R_2=400 \Omega$, $R_3=600 \Omega$, $R_4=1000 \Omega$, $C_4=0.5 \mu\text{F}$. Calculate values of R_1 and L_1 . Calculate also the values of storage factor (Q) of coil if frequency is 2000 Hz.	12
		
Q7)a)	Where potential transformers (P.Ts.) are used? What are its advantages? Explain 'P.T.' using phasor diagram.	12
b)	With the help of phasor diagram write short note on C.T.	8



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End Semester Exam
May 2018



Max. Marks: 50

Class: SY..B.Tech

Name of the Course: OCIS/PCT

Semester: IV

Duration: 02 Hours

Program: Mechanical/ Electrical

Course Code: BTM406/BTE232

Instruction: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is for their use.

- 1) Question No. 1 a is compulsory.
- 2) Out of remaining questions, attempt any 4
- 3) In all 5 questions to be attempted.
- 4) Answer to each new question to be started on a fresh page.
- 5) Figures in brackets on the right hand side indicate full marks.
- 6) Assume suitable data if necessary.
- 7) Please write answers to the point. Vague answers will not get marks

Question No		Maximum Marks	Course Outcome Number	Module No.
Q1.	<i>Question 1 a is compulsory and choose any two from the rest b,c , and d.</i>	06	1, 2, 5,	4,5.6 ,7
a.	What are the elements you would include in a report? Which elements is the most important one according to you and why? What are the factors you need to consider before writing a report?			
b.	Define a Resume. What role does it play in getting you an interview for a Job? 04			
c.	What criterions one has to keep in mind for goal setting and decision making?			
d.	Elaborate on the evaluation criteria of a Group Discussion? What qualities one needs to possess to emerge a leader in a GD?			
Q2	Imagine you are the Sales Manager of a medium sized company, which produces electronic toys, and is facing a strike by the sales representatives of the Mumbai region who are demanding a 40 % hike in their sales incentive. The back ground information to the case is as below <ul style="list-style-type: none"> • Most of the sales representative are very senior • Sales representatives work 40 hours week, with one hour lunch break. 	(10)	1, 2,5	4

	<ul style="list-style-type: none"> • Travelling in Mumbai is difficult due to traffic • The salary structure is linked to their sales performance • There is an increasing competition due to new players in the market • Sales representatives have a strong union • The quality of the product is also deteriorating <p>The managing Director at the company headquarters in Delhi has asked you to investigate the causes of poor sales and offer recommendations. Write a Memo report taking into consideration the above problems.</p>			
Q.3.	Define a leader. Explain four different types of leadership styles with examples.	(05)	3,4,	06
A.	State whether the following statements are true or false:	(05)	2, 1	03, 01,0 6,04
B.	<ol style="list-style-type: none"> 1) Questionnaire is the most effective method of collecting data 2) Feasibility reports give information about the progress of a particular project or scheme 3) The book form is preferred for short reports 4) The appendix is a list of visual aids and graphics used in the reports 5) The length of an abstract is generally 2 to 5 % of that of the entire report. 6) Teamwork is the concept of people working together cooperatively with diverse goals. 7) A resume is your mouth piece written for a prospective employer. 8) Some people are born in with good manners. 9) A business card should be presented to another person at the beginning of the introduction. 10) Procrastination is one of the time waste of time management 			
Q.4.	What are the main contents of the minutes of a meeting? What are some specific principles for effective writing of minutes?	(05)	01, 03,02,5	02
a				
Q.4.	Jyothi's concepts are clear and her reasoning is sound, but in the feedback to her presentations, the audience often says she is very feeble, cannot be heard beyond two rows. You want to see Jyothi improve the quality of delivery and presentation skills as you feel it is critical skill needed to move forward. What suggestions would you give her?	(05)	01. 05, 06	04
b.				
Q.5.	Wanted a quality Assurance manager at our manufacturing unit in Mumbai. Applicants should have a degree in Mechanical/ Electrical Engineering, and should have worked in an engineering organization, preferably with exposure to knowledge on six sigma, IOT, Python, Deep analysis.	(10)	1, 2, 3, 4, 5.	1,2,3 , 4, 5,

	Please send your detailed resumé with a cover letter to Corporate HRD, JBM group, Neel House, Lado Sarai, New Delhi-110030.			
Q.6.	<p>Imagine that you are the secretary in attendance at the 7th meeting of the management committee of Bombay department stores to be held on May 25th 2016. Draft the notice and minutes of this meeting assuming the agenda to be as follows:-</p> <p>a. Confirmation of minutes of the previous meeting b. Appointment of sales women c. Proposal for delivery vans d. New app for taking online orders e. Complains regarding the quality of dairy products f. Ban on plastic bags in all stores g Online service and delivery to customers h. Any other matter with the permission of Chairman i. Date for the next meeting</p>	(10)	1,2	02,0 1
Q.7.	<p>Case Study:</p> <p>Saminder, a fresh graduate, joined an Indian IT firm. On the first day in office he, wanted to be his natural self. So, he wore a pair of jeans and shirt and he walked into his office. He got to meet his boss, and the first question the latter asked him was, "Did you not find out about the dress code we follow?" Saminder was perplexed. After all, he was under the impression that IT companies had a casual work environment.</p> <p>He was assigned to a project and after some training, he was able to give his best. He interacted with his team mates and his clients, and was happy that he was doing a very good job. A year passed by and it was time for his performance discussion. There was a shocking news in store for him at the discussion: He was rated "one of the lowest" performers in his team. He was furious and walked in his manager's cubicle.</p> <p>This is what Saminder's manager told him: 'you are diligent at work, but apart from the good work you do, there are some unwritten rules of the organization that you must follow. I am being very open as I want you to grow in this company. Here, people like to be addressed as 'sir' and 'madam' and not by their first names. However, you do not follow this practice. Calling people by their first names is offensive in this company'.</p> <p>Saminder's manager once again touched upon the issue of dress code. He said: 'you are expected to wear formals on all days except Friday. Often, I see you coming to office unshaven, shirt untucked, and wearing jazzy colors. This kind of dressing does not go well with the culture of the company. Moreover, you often come in late and work late, which disturbs the working schedule of the other team members. Here, employees are expected to come on time and leave on time.'</p>	(10)	4, 5	06

Sarminder's manager asked him whether he remembered what happened during a visit to their office by clients, when Saminder had been asked to come in formal attire. 'you disrespected that request of ours,' the managers reminded Saminder. 'moreover, on the same occasion, in spite of telling you multiple times, you spoke in Hindi in front of your clients knowing well that they understood English only. In the same meeting, your mobile phone rang twice, to which they objected. The impression that you created among them was not good, and they refused to involve you in the project. However in spite of this, we have requested them to keep you, owing to the work you did. 'Saminder's manager also reminded him that at the dinner hosted by the clients, Saminder drank so much that he lost his senses. 'You made a lot of noise while you were eating, and busy grabbing food instead of focusing on the interaction with the clients.'

Saminder was also told that many of his colleagues had complained that he spoke loudly on the phone while in his cubicle. 'When you pick up your mobile phone, you do not go to a private space. This has caused a lot of problems to people around you,' the manager said.

The manager said that when Saminder attended conference calls with clients, irrespective of what was being discussed, he kept the phone at a high volume. 'While talking, you are loud, and during informal, friendly conversations, your use of slang and abuses have been noticed by many. You have discussed politics and got into fights with your colleagues on many occasions.'

The manager reminded Saminder that the day he joined, he had been told about the appropriate conduct expected of him. He told Saminder: 'I told you about the dress codes we follow and our work culture. Saminder, you have often been found sleeping after the lunch hour on your table. During office hours, many senior managers have noticed you with a novel in hand, which does not give the right picture about you.'

Women colleagues have also complained of you sending what's app messages after office hours. You have also not refrained from criticizing management on social networking site.

He added: Remember that doing well in your job is not enough. The professional space is also about how to carry yourself.'

Questions:

1. On what fronts did Saminder violate the etiquettes? Write your answer in points
2. How can Saminder Improve his Image in front of colleagues? Elaborate on the professional etiquettes that he should follow.



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End Semester Exam

May 2018



Max. Marks: **100**

Class: **SY B. Tech**

Semester: **IV**

Duration: **3 hrs**
Program: **Electrical Engineering**

Name of the Course: **Microprocessor and Microcontroller**

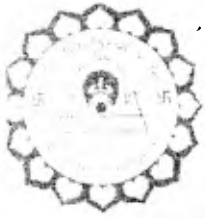
Course Code: **BTE231**

Instructions:

- Question 1 is compulsory.
- Attempt any **four** of the remaining questions.
- Assume suitable data if required.
- Answers to all sub-questions should be grouped together.

Question No		Module No.	Maximum Marks	Course Outcomes Number
Q1 a)	Define instruction cycle, machine cycle and T state.	1	5	
b)	Write a program to create a square wave of 66% duty cycle on bit 3 of port 1.	5	5	
c)	Compare microprocessors and microcontrollers.	3	5	
d)	Explain TMOD function register and its timer modes of operation.	4	5	
Q2 a)	Design a microcontroller system using 8051 microcontroller, 16KB of ROM and 32 KB of RAM. Clearly show the memory map with address range and Draw the interfacing diagram. (Interface the external memory such that the starting address of ROM is 0000H and RAM is 8000H)	6	6	
b)	Draw and explain the architecture of 8085 microprocessor.	3	(4+6)	
c)	Draw and explain internal structure of CPU.	1	4	
Q3 a)	Explain the addressing modes of 8085 microprocessor with examples.	3	8	
b)	With a frequency of 22MHz, generate a frequency of 100 KHz on pin P2.3. Use timer1 in mode1.	5	8	

c)	What is machine instruction? What are the elements of machine instructions?	1	4	1
Q4 a)	Draw and explain the architecture of 8051 microcontroller.	4	10	2
b)	In a semester a student has to take five courses. The marks of the student (out of 25) are stored in RAM locations 50H onwards, write an ALP to find the average marks and output it to PORT1.	5	6	3
c)	Explain interrupt driven I/O technique of data transfer.	2	4	1
Q5 a)	Take 10 bytes of data from Data RAM locations 45H to 54H, add 02 to each of them and save the result in data RAM location 79H down to 70H.	5	6	3
b)	Draw and explain the interfacing of Analog to digital Converter with 8051. Write a program for the same.	7	8	3,4
c)	Explain the matrix keyboard interfacing of 8051 microcontroller with neat diagram.	6	6	3,4
Q6 a)	List the features of 8086 processor.	3	4	2
b)	Explain source initiated data transfer using handshaking signals and strobe signals with timing diagram and block diagram with sequence of events.	2	8	1
c)	Write an Assembly language program to generate a square wave at bit 0 of port C of 8255PPI. Write the control register format of 8255PPI.	6	8	3,4
Q7a)	Explain the following instructions MOV A,@R ₀ LJMP label SWAP A CJNE A,#data,loop1 DAA	5	10	2.
b)	With a neat circuit representation, illustrate interfacing of Digital to analog Converter (DAC) with 8051. Write a program to generate a triangular waveform using DAC.	7	10	3.



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Re-Examination

Program: Electrical Engg
Duration: 3 hr.
Maximum Marks: 100
Name of the Course: **ELEMENTS OF POWER SYSTEM**

Date: June 2018
Course code: BTE229
Semester: IV

Instructions:

- Solve any 5 questions
- Assume suitable data if necessary give justifications for the same

- Q1) a) Explain proximity effect in power system. 8
b) Why high voltage transmission is done? 4
c) What is surge impedance loading? 8
- Q2) a) The daily demands of three consumers are given below: 16

Time	Consumer 1	Consumer 2	Consumer 3
12 mid night to 8 AM	No load	200 W	No load
8 am to 2 pm	600 W	No load	200 W
2 pm to 4 pm	200 W	1000 W	1200W
4 pm to 10 pm	800 W	No load	No load
10pm to mid night	No load	200 W	200 W

- Plot the load curve and find 1) maximum demand of individual consumer 2) load factor of individual consumer 3) diversity factor 4
- b) Name the different types of tariffs.
- Q3)a) Write short note on following topics 8
1. Mathematical derivation of string efficiency. 8
2. Bundled conductors 6
3. skin effect 6
- Q4)a) Write a short note on corona effect on transmission line using following factors. 20
1) define phenomena of corona 2) factors affecting corona 3) critical disruptive voltage 4) methods of reducing corona effect

- Q5)a) Derive expression for line to neutral capacitance of three phase line with unsymmetrical spacing conductors 14
- b) Generator is rated is rated at 200 MVA, 11 KV. Its reactance is 0.3 p.u. Find p.u. reactance on 100 MVA, 33 KV base. 6
- Q6) Write short note on following topics 20
1. Earth resistance measurement
 2. GMD and GMR of transmission line conductors
- Q7) Explain briefly any of the conventional electrical generating power plant using points mentioned below. 20
- a) Site selection of plant b) block diagram c) working of plant d) Efficiency



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End Semester Exam
May 2018



Max. Marks: 100
Class: S.Y. B. Tech. Electrical
Program: Electrical Engineering
Name of the Course: Analog Circuits

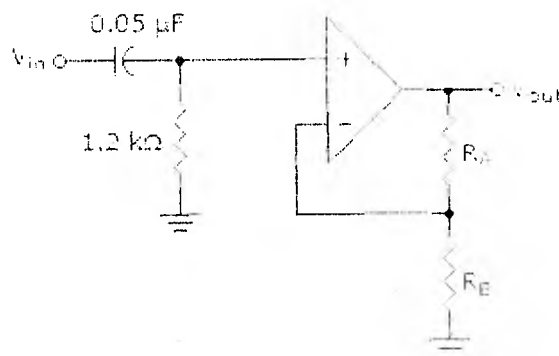
Duration: Three Hours
Semester: IV

Course Code: BTE227

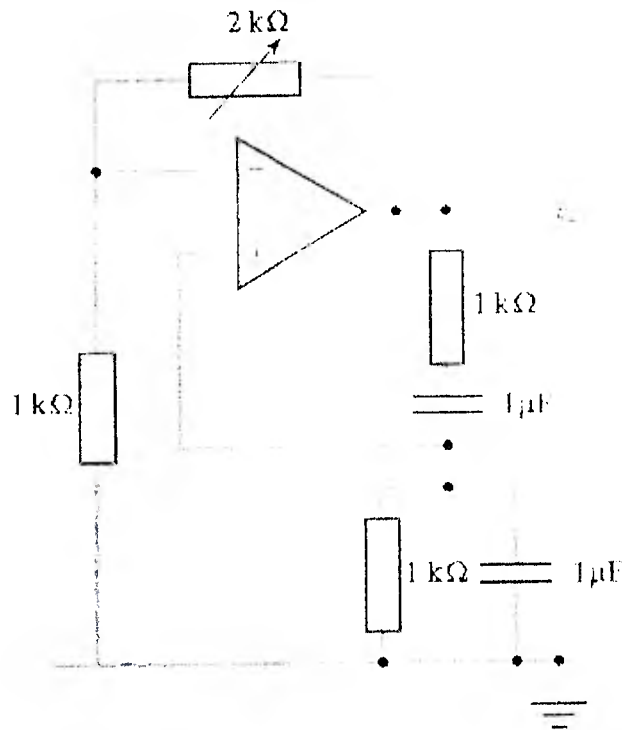
Instructions:

- Question No. 1 is compulsory
- Attempt **any Four** questions out of remaining SIX questions.
- Answer to all sub questions should be grouped together.
- Use semilog paper to plot the frequency response.
- Figures to the right indicate **full marks**.

Q. No		Max Marks	Course Outcome Number	Module Number
1	Determine the frequency of oscillation for the astable multivibrator using IC-555. Given that $R_A = R_B = 1K\Omega$ and $C = 1000 \mu F$.	2	CO2	3
2	To generate a 1MHz signal, which is the most suitable circuit? Why?	2	CO5	7
3	Voltage gain of an amplifier without feedback is 60dB. It decreases to 40dB with feedback. Calculate the feedback factor.	2	CO4	6
4	Why opamp is considered as suitable amplifier at low frequency?	2	CO4	2
5	Which type of power amplifier is biased for operation at less than 180° of the cycle? State the application.	2	CO1	1
6	What is meant by Roll Off rate? What is the roll off rate for the circuit shown below? Given $R_A = 33K\Omega$ and $R_B = 10K\Omega$	2	CO5	5

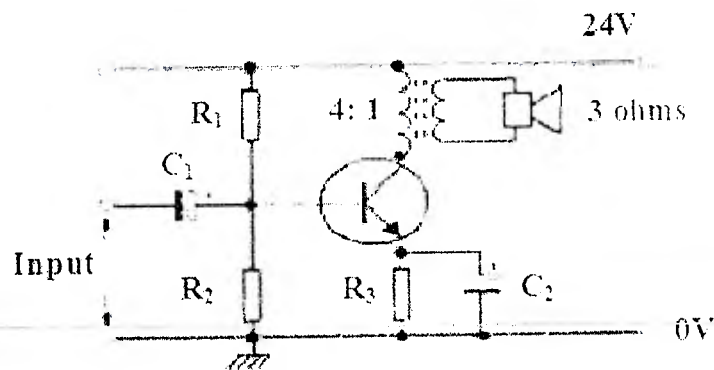


7 Calculate the frequency of oscillation. 2 CO5



- 8 What is the difference between switching regulator and linear regulator? 2 CO3 1
- 9 State Barkhausen criteria. 2 CO5 7
- 10 What do you mean by stop band with respect to active filter? 2 CO5 5

- 2 A Explain complementary symmetry class B push pull power amplifier with neat circuit diagram and waveforms 10 CO1 1
- B Refer to Fig. If the amplifier is delivering 5 W of audio power to the loudspeaker, what will be the approximate RMS voltage across the transformer primary? 05 CO1 1



- C What is the difference between small signal amplifier and large 5 CO1 1

signal amplifier?

3	With the help of proper circuit arrangements using IC 555 and suitable components obtain		CO2	3
A	PWM	10		
B	Schmitt trigger	10		
4	A Explain with proper diagrams foldback current limiting technique with respect to IC 723	12	CO3	1
B	Using 7805 voltage regulator design a current source to deliver 0.25 A current to a load of 48Ω , 10 W. Given $I_D = 4.2 \text{ mA}$.	8	CO3	4
5	A Which of the low-frequency cutoffs (lowest, middle or highest) determined by C_S , C_C , or C_T will be the predominant factor in determining the low-frequency response for the complete system? Explain the reason	6	CO5	2
B	Determine higher cutoff frequency for common emitter amplifier (potential divider bias with R_E bypassed). Given: $V_{CC} = 10\text{V}$, $C_{bc} = 40\text{pF}$, $C_{be} = 5\text{pF}$, $C_{cc} = 2\text{pF}$, $C_{wt} = 8\text{pF}$, $C_{wo} = 6\text{pF}$, $C_s = 1\mu\text{F}$, $C_E = 10 \mu\text{F}$, $C_C = 0.22\mu\text{F}$, $h_{ie} = 100$, $h_{ic} = 4.4\text{K}\Omega$, $R_s = 600\Omega$, $R_1 = 18 \text{ K}\Omega$, $R_2 = 4.7\text{K}\Omega$, $R_C = 1.5\text{K}\Omega$, $R_E = 5\text{K}\Omega$, $R_F = 1.2 \text{ K}\Omega$	14	CO1	2
6	State whether following statements are true or false. Justify your answer.	20	CO4	6
A	Current to voltage converter using opamp is an example of voltage shunt feedback.			
B	Input impedance increases in case of current series feedback			
C	In case of emitter follower circuit, feedback factor is 100%			
D	Gain of the amplifier without feedback is 40. Bandwidth of the amplifier without feedback is 20kHz. With negative feedback of 1 % bandwidth increases to 28kHz.			
7	A The input applied to the circuit shown below is $2\sin(2\pi f)t$. Determine the output voltage for a frequency variation from 10 Hz to 10KHz. Plot the graph of output voltage versus frequency Given $R_A = R_B = 10\text{K}\Omega$. Calculate and indicate on the graph the cutoff frequency and output voltage at cutoff frequency. Identify the circuit referring to the frequency response curve plotted.	14	CO5	5



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End Semester Examination
May 2018



Maximum Marks: 100

Class: S.Y.B.Tech

Name of the Course: Engineering Mathematics IV

Semester: IV

Duration: 3 hours

Program: Electrical Engineering

Course Code : BTE226

Instructions:

1. Question No.1 is compulsory. Attempt any four from remaining six questions.
2. Attempt Questions serially and answers to all sub questions should be grouped together.
3. Write complete answers with formulas and statement of theorems used.
4. If you attempt more questions, specify which five (Including Q.1) should be graded. Otherwise, by default, only the first five will be graded.

Q		Marks	CO	Module												
1(a)	Find Mean and Variance of the random variable with probability density function $g(y) = \begin{cases} 4\left(y + \frac{4}{5}\right)^3, & -\frac{4}{5} \leq y \leq \frac{1}{5} \\ 0, & \text{otherwise} \end{cases}$	6	1	3												
(b)	Evaluate $\int_C \sqrt{1+x^3} dx + 2xydy$, where C is the triangle with vertices (0,0), (1,0) and (1,3) oriented anti-clockwise.	6	2	1												
(c)	Obtain all Taylor's and Laurent's series expansions of $f(z) = \frac{1}{z(z-1)^2(z+2)}$ about $z=1$ indicating the region of convergence	8	3	7												
2(a)	The following table shows the amount of diesel required by a train to travel certain distances. <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <tr> <td>Distance (X km)</td> <td>90</td> <td>150</td> <td>230</td> <td>310</td> <td>390</td> </tr> <tr> <td>Diesel used (Y litres)</td> <td>19.2</td> <td>33.9</td> <td>49.0</td> <td>79.5</td> <td>89.9</td> </tr> </table> <p>This data can be modelled by the regression line with equation $y = ax + b$</p>	Distance (X km)	90	150	230	310	390	Diesel used (Y litres)	19.2	33.9	49.0	79.5	89.9	6	1	2
Distance (X km)	90	150	230	310	390											
Diesel used (Y litres)	19.2	33.9	49.0	79.5	89.9											

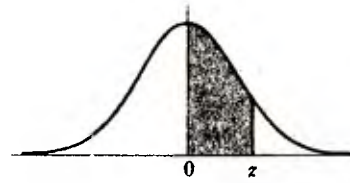
	(i) Find the values of a and b (ii) Use the model to estimate the amount of diesel the train would use if it is driven 270 km.			
(b)	The finish times for marathon runners during a race are normally distributed with a mean of 195 minutes and a standard deviation of 25 minutes. a) What is the probability that a runner will complete the marathon within 3 hours? b) Calculate to the nearest minute, the time by which the first 8% runners have completed the marathon.	6	1	4
(c)	Verify Green's Theorem for $\int_C x^2 y^2 dx + (yx^3 + y^2) dy$ where C is the boundary of the triangle having vertices at (0,0), (4,2) and (4,-8)	8	2	1
3 (a)	Determine the nature of singular points of the following functions and also determine the residue at each pole (i) $f(z) = \frac{\sin^2 z}{z^3}$ and (ii) $g(z) = z^2 \sin\left(\frac{1}{z}\right)$	6	3	6
(b)	A machinist is expected to make engine parts with axel diameter of 1.75 cm. A random sample of 10 parts shows a mean diameter 1.85 cm with standard deviation 0.1 cm. On the basis of this sample, would you say that the work of the machinist is inferior?	6	1	5
(c)	Evaluate $\iint_S (\nabla \times \vec{F}) \cdot \vec{ds}$ where $\vec{F} = yz\hat{i} + x^2 z\hat{j} + xyk$ and S is the surface of the paraboloid $z = 9 - x^2 - y^2$ that lies above the plane $z = 5$	8	2	1
4 (a)	Prove that $\int_C \log z dz = 2\pi i$, where C: $ z =1$	6	3	6
(b)	If the light bulbs in a house fail according to a Poisson law, and over the last 15 weeks there have been 5 failures, find the probability that there will not be more than one failure next week.	6	1	4
(c)	If θ is the acute angle between the two regression lines, then prove that $\tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$, where r, σ_x, σ_y have their usual meanings.	8	1	2

5 (a)	An ambulance service claims that it takes on an average 8.9 minutes to reach its destination in emergency calls. To check on this claim, the agency which licenses ambulance services has them timed on 50 emergency calls, getting a mean of 9.3 minutes with standard deviation of 1.6 minutes. What can they conclude at the level of significance $\alpha = 0.01$?	6	1	5												
(b)	Calculate the correlation coefficient between x and y from the following data $n = 10, \sum x = 140, \sum y = 150, \sum (x - 10)^2 = 180,$ $\sum (y - 15)^2 = 215, \sum (x - 10)(y - 15) = 60.$	6	1	2												
(c)	The download time of a resource web page is normally distributed with a mean of 6.5 seconds and a standard deviation of 2.3 seconds. (i) What proportion of page downloads take less than 5 seconds? (ii) What is the probability that the download time will be between 4 and 10 seconds? (iii) How many seconds will it take for 35% of the downloads to be completed?	8	1	4												
6(a)	Two random sample gave the following data <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sample No</th> <th>Size</th> <th>Mean</th> <th>Variance</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1000</td> <td>67.42</td> <td>2.58</td> </tr> <tr> <td>2</td> <td>1200</td> <td>67.25</td> <td>2.5</td> </tr> </tbody> </table> Is the difference between standard deviation significant?	Sample No	Size	Mean	Variance	1	1000	67.42	2.58	2	1200	67.25	2.5	6	1	5
Sample No	Size	Mean	Variance													
1	1000	67.42	2.58													
2	1200	67.25	2.5													
(b)	In a restaurant an average of 3 out of every 5 customers ask for water with their meal. A random sample of 10 customer is selected. Find the probability that (i) Exactly 6 customers ask for water with their meal, (ii) Less than 9 customers ask for water with their meal.	6	1	4												
(c)	Given that $u = x - y$ and $v = x + y$. If x & y are uncorrelated , then prove that $r(u, v) = r_{uv} = \frac{\sigma_x^2 - \sigma_y^2}{\sigma_x^2 + \sigma_y^2}$	8	1	2												

7(a)	Use Gauss Divergence Theorem to evaluate $\iint_S \vec{F} \cdot \hat{n} ds$, where S is the surface of the cuboid with vertices $(\pm 1, \pm 2, \pm 3)$ and $\vec{F} = x^2 z^3 \hat{i} + 2xyz^3 \hat{j} + z^5 \hat{k}$	6	2	1
(b)	The probability that a match will not strike is 0.009. Calculate the probability that in a box of 100 matches: (a) they all strike satisfactorily (b) at least 2 do not strike	6	1	4
(c)	Evaluate $\int_C \frac{z^2 - z}{(z+1)^2 (z^2 + 4)} dz$, where C: $ z-1 =4$	8	3	7

Appendix C

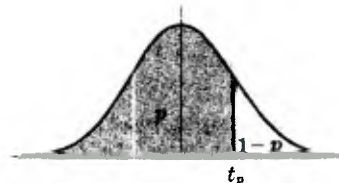
Areas
under the
Standard
Normal Curve
from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

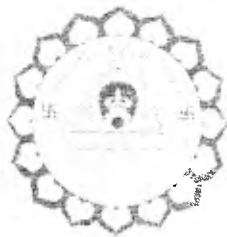
Appendix D

Percentile Values (t_p)
for
Student's t Distribution
with ν Degrees of Freedom



ν	$t_{.55}$	$t_{.60}$	$t_{.70}$	$t_{.75}$	$t_{.80}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$
1	.158	.325	.727	1.000	1.376	3.08	6.31	12.71	31.82	63.66
2	.142	.289	.617	.816	1.061	1.89	2.92	4.30	6.96	9.92
3	.137	.277	.584	.765	.978	1.64	2.35	3.18	4.54	5.84
4	.134	.271	.569	.741	.941	1.53	2.13	2.78	3.75	4.60
5	.132	.267	.559	.727	.920	1.48	2.02	2.57	3.36	4.03
6	.131	.265	.553	.718	.906	1.44	1.94	2.45	3.14	3.71
7	.130	.263	.549	.711	.896	1.42	1.90	2.36	3.00	3.50
8	.130	.262	.546	.706	.889	1.40	1.86	2.31	2.90	3.36
9	.129	.261	.543	.703	.883	1.38	1.83	2.26	2.82	3.25
10	.129	.260	.542	.700	.879	1.37	1.81	2.23	2.76	3.17
11	.129	.260	.540	.697	.876	1.36	1.80	2.20	2.72	3.11
12	.128	.259	.539	.695	.873	1.36	1.78	2.18	2.68	3.06
13	.128	.259	.538	.694	.870	1.35	1.77	2.16	2.65	3.01
14	.128	.258	.537	.692	.868	1.34	1.76	2.14	2.62	2.98
15	.128	.258	.536	.691	.866	1.34	1.75	2.13	2.60	2.95
16	.128	.258	.535	.690	.865	1.34	1.75	2.12	2.58	2.92
17	.128	.257	.534	.689	.863	1.33	1.74	2.11	2.57	2.90
18	.127	.257	.534	.688	.862	1.33	1.73	2.10	2.55	2.88
19	.127	.257	.533	.688	.861	1.33	1.73	2.09	2.54	2.86
20	.127	.257	.533	.687	.860	1.32	1.72	2.09	2.53	2.84
21	.127	.257	.532	.686	.859	1.32	1.72	2.08	2.52	2.83
22	.127	.256	.532	.686	.858	1.32	1.72	2.07	2.51	2.82
23	.127	.256	.532	.685	.858	1.32	1.71	2.07	2.50	2.81
24	.127	.256	.531	.685	.857	1.32	1.71	2.06	2.49	2.80
25	.127	.256	.531	.684	.856	1.32	1.71	2.06	2.48	2.79
26	.127	.256	.531	.684	.856	1.32	1.71	2.06	2.48	2.78
27	.127	.256	.531	.684	.855	1.31	1.70	2.05	2.47	2.77
28	.127	.256	.530	.683	.855	1.31	1.70	2.05	2.47	2.76
29	.127	.256	.530	.683	.854	1.31	1.70	2.04	2.46	2.76
30	.127	.256	.530	.683	.854	1.31	1.70	2.04	2.46	2.75
40	.126	.255	.529	.681	.851	1.30	1.68	2.02	2.42	2.70
60	.126	.254	.527	.679	.848	1.30	1.67	2.00	2.39	2.66
120	.126	.254	.526	.677	.845	1.29	1.66	1.98	2.36	2.62
∞	.126	.253	.524	.674	.842	1.28	1.645	1.96	2.33	2.58

Source: R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (previously published by Oliver and Boyd, Edinburgh), and by permission of the authors and publishers.



Bharatiya Vidya Bhavan's
Sardar Patel College of Engineering

(A Government Aided Autonomous Institute)
 Munshi Nagar, Andheri (West), Mumbai - 400058



ENDSEMESTER

Program: Electrical Engg

Duration: 3 hr.

Maximum Marks: 100

Name of the Course: **Signals and systems**

Date: MAY 2018

Course code: BTE230

Semester: IV

Instructions:

(1) Answer any five questions

(2) All questions carry equal marks

Q No.		Max. Marks	CO No	Mod No
Q1(a)	Consider the following signal. Is $x(t)$ is an energy signal or power signal. $x(t) = Ae^{-\alpha t}u(t) \quad \alpha \geq 0$	05	1	1
(b)	Is the system $y(t) = x(t^2)$ is linear, causal and time invariant?	05	1	1
(c)	Determine whether the discrete time sequences i) $\cos(3\pi n)$ & ii) $\sin(\frac{n}{8})$ are periodic or not. If the sequence is periodic, find out the period of the sequence.	05	1	1
(d)	Plot the following signals. i. $x(t) = 2u(t) + 2u(t-2) - 2u(t-4) - 2u(t-6)$ ii. $x(n) = 2^n u(n)$	05	1	1
Q2(a)	The input $x(t)$ and impulse response $h(t)$ of a system are described by $x(n) = \{1,2,3,4\}$ and $h(n) = \{-1,2,1,-2\}$ Find the output response by convolution using any two methods.	10	2	2
Q2(b)	Define Laplace transform. What is the relation between Laplace Transform and Fourier Transform? Find the Laplace transform of the signal. $x(t) = e^{at}u(t) \quad t \geq 0$	10	4	4
Q3(a)	Derive trigonometric Fourier series expansion for a signal $x(t)$.	10	3	3
Q3(b)	Find the inverse Z transform system with transfer function $H(z) = \frac{8z-19}{z^2-5z+6}$	10	2	5
Q4(a)	Determine the zero input response and zero state response of the given system if it is described by $y(n) = 0.5y(n-1) + x(n)$ and input given to the system is given by $x(n) = (\frac{1}{3})^n u(n)$ with $y(-1) = 1$.	10	5	6
Q4(b)	Find out the Fourier transform of the following signals. i. $f(t)$ =unit impulse function ii. $x(n)$ = $u(n)$	10	4	4

Q5(a)	Find out the exponential Fourier series for unit impulse train. Plot its magnitude and power spectrum.	10	3	3
Q5(b)	Find the inverse Laplace transform of $F(s) = \frac{-3}{(s+2)(s-1)}$ for all ROCs.	10	4	4
Q6(a)	State and prove the any five properties of Z transform.	10	5	5
Q6(b)	Determine the initial and final values of the function whose Laplace transform is given by $X(s) = \frac{5s + 50}{s(s + 5)}$	10	4	5
Q7(a)	A difference equation of a discrete time system is given below. Draw direct form- I and direct form II structures. $y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$	10	5	7
Q7(b)	A continuous time LTI system is described by $y'(t) + 2y(t) = 3x(t)$. Find transfer function, impulse response and step response.	10	2	2