AIKTC/KRRC/SoET/ACKN/QUES/2018-19/ **Date:** _____

School: SoET-CBCS **Branch:** ELECT. ENGG. **SEM:** III

To,
Exam Controller,
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Applied Mathematics- III	EEC301		✓	02
2	Electronic Devices & Circuits	EEC302		✓	02
3	Conventional And Non-Conventional Power Generation	EEC303			
4	Electrical and Electronics Measurement	EEC304		✓	02
5	Electrical Machine – 1	EEC305		✓	02

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

Duration – 3 Hours **Total Marks : 80**

N.B.:- 1. **Question no 1 is compulsory.**
2. **Attempt any THREE questions out of remaining FIVE questions.**

Q.1 a) Find Laplace Transform of the given function $f(t)= e^{-5t}\, erf(\sqrt{t})$. **(5)**

b) Prove that $J_{-\frac{3}{2}} = -\sqrt{\frac{2}{\pi x}}\left(\frac{\cos x}{x} + \sin x\right)$ **(5)**

c) Find complex form of Fourier series of $cosh2x + sinh2x$; $(-\pi, \pi)$. **(5)**

d) Find the Directional derivative of $F = x^2 - y^2 + 2z^2$ at P(1,2,3) in the direction of the line PQ where Q is the point (5,0,4).In what direction will it be maximum? What is the magnitude of this maximum? **(5)**

Q.2 a) Prove that $\nabla \times \left[\frac{\bar{a} \times \bar{r}}{r^3}\right] = \frac{-\bar{a}}{r^3} + \frac{3(\bar{a} \cdot \bar{r})\,\bar{r}}{r^5}$. **(6)**

b) Show that the set of functions $\left\{Sin\left(\frac{\pi x}{2L}\right), Sin\left(\frac{3\pi x}{2L}\right), Sin\left(\frac{5\pi x}{2L}\right), \ldots\ldots\right\}$ forms an orthogonal set over the interval $[0, L]$. Construct corresponding orthonormal set. **(6)**

c) Determine the analytic function f(z) = u + iv if $3u + 2v = y^2 - x^2 + 16xy$. **(8)**

Q.3 a) Find the Bilinear transformation that maps the points $z = 1, i, -1$ into $w = 0, 1, \infty$. **(6)**

b) Prove that $\int_0^{\infty} \frac{e^{-\sqrt{2}t} \sin t \sinh t}{t}\, dt = \frac{\pi}{8}$ **(6)**

c) Obtain Fourier series of $f(x) = \begin{cases} x + \pi/2 & -\pi \le x \le 0 \\ \pi/2 - x & 0 \le x \le \pi \end{cases}$ **(8)**

Hence deduce that $\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots$

Q.4 a) Find the Fourier sine transform of e^{-x}, $x \ge 0$,and hence deduce that $\int_0^{\infty} \frac{x \sin mx}{1+x^2}\, dx = \frac{\pi}{2} e^{-m}, m \ge 0$. **(6)**

b) Find Inverse Laplace Transform of $\frac{(s+2)^2}{(s^2+4s+8)^2}$ using Convolution theorem. **(6)**

c) Verify Green's theorem for $\bar{F} = (x^2 - xy)i + (x^2 - y^2)j$ and C is the closed curve formed by $x^2 = 2y, x = y$. **(8)**

Q.5 a) Prove that $\int J_5(x)dx = -J_4 - \frac{4}{x}J_3(x) - \frac{8}{x^2}J_2(x)$. **(6)**

b) Evaluate $\iint_S \bar{F} \cdot \bar{n}dS$ where S is the surface of the region bounded by $x^2 + y^2 = 4, z = 0, z = 3$ and $\bar{F} = 4x\bar{i} - 2y^2\bar{j} + z^2\bar{k}$. **(6)**

c) Find inverse Laplace transform of

(i) $\log\left(\frac{s^2 + a^2}{(s+b)^2}\right)$ **(4)**

(ii) $\frac{e^{-2s}}{s^2 + 8s + 25}$ **(4)**

Q.6 a) Prove that $\bar{F} = (6xy^2 - 2z^3)\bar{i} + (6x^2y + 2yz)\bar{j} + (y^2 - 6z^2x)\bar{k}$ is a conservative field. Find the scalar potential for $\bar{F}$. Hence find the work done in moving a particle from (1,0,2) to (0,1,1) **(6)**

b) Express the function $f(x) = -e^{-kx}$, for $x<0$ & $f(x) = e^{-kx}$, for $x > 0$ as Fourier integral and hence deduce that **(6)**
$\int_0^\infty \frac{\omega \sin \omega x}{\omega^2 + k^2} d\omega = \frac{\pi}{2}e^{-kx}, if\ x > 0, k > 0.$

c) Solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - y = 3te^{-t}$, $y(0) = 4$, $y'(0) = 2$ using Laplace Transform **(8)**

SE-sem-III - Choice Based - Electrical

Paper / Subject Code: 51002 / Electronics Device and Circuit

14/8/1

Q. P. Code: 23920

(3 Hours) **[Total Marks:80]**

N.B. (1) Question No.1 is compulsory.
(2) Attempt any Three from the rest.
(3) Figure to right indicate full Marks.
(4) Assume the suitable data if it is necessary.

Q.1 Answer any Four of the following.

(a) Justify Zener diode can be used as a voltage regulator. 5M
(b) Explain Barkhausen criterion for sustained oscillations. 5M
(c) Explain different types of coupling. 5M
(d) Explain thermal runaway and stabilization in BJT. 5M
(e) Explain the effect of negative feedback on bandwidth and overall gain. 5M

Q.2 (a) Draw circuit diagram of full wave bridge rectifier with CLC filter. Explain its working with neat sketches and Derive expression for ripple factor. 10M

(b) What are the types of MOSFET? Explain their construction and working. 10M

Q.3 (a) In a circuit shown in Fig.1 determine I_{CQ} and V_{CEQ}. Draw the DC load line on output characteristics and show the location of Q-point. Comment on the region of operation. 10M

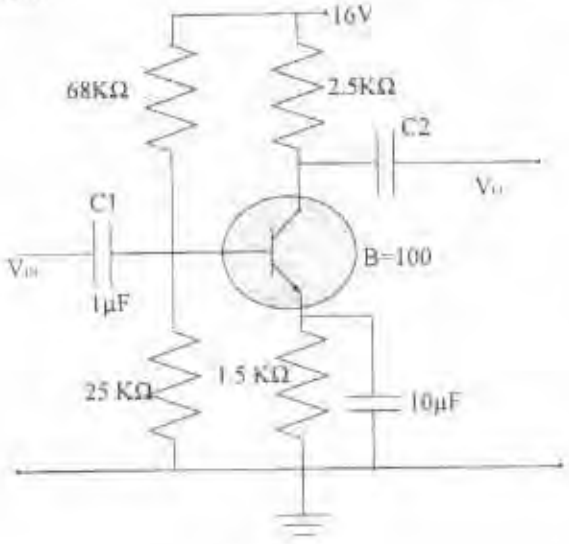

Fig.1

(b) Draw circuit diagram of RC phase shift oscillator. Derive an expression for its frequency of oscillation. 10M

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Q.4 (a) Derive expression for voltage gain, output impedance and input impedance of common source JFET amplifier. 10M

(b) Explain the working of CE amplifier with its frequency response. 10M

Q.5 (a) For the Common Source amplifier using fixed bias configuration as shown in Fig.2 ,the Q point is defined as I_{DQ} = 6 mA and V_{GSQ} = -- 2 V. The values of I_{DSS} and V_P are 10 mA and --7 V respectively. The value of Y_{OS} = 40 µS. Calculate (a) g_m (b) r_d (c) Z_i (d) Z_o (e) Av 10M

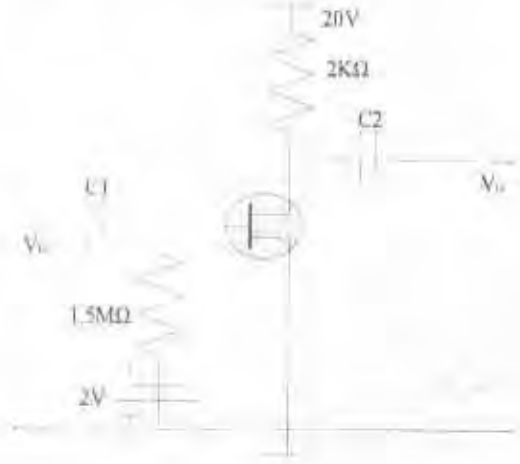

Fig.2

(b) Compare different biasing methods of JFET. 5M

(c) Compare the different negative feedback amplifiers. 5M

Q.6 Answer any Two of the following.

(a) Write short note on H-parameter model. Derive the necessary expression for A_V, Z_i, Z_o 10M

(b) What is Darlington configuration? Derive the expression of voltage gain for Darlington pair emitter follower. 10M

(c) Draw neat diagram of UJT relaxation oscillation. Explain its operation. Derive the expression for frequency of output signal. Draw various waveforms. 10M

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SE-Sem-III – Choice Based – Electrical 24/5/19

Paper / Subject Code: 51004 / Electrial and Electronics Measurement

Q.P. Code: 27111

Duration – 3 Hours **Total Marks assigned to the paper- 80**

N.B.:- (1) Question No.1 is compulsory
(2) **Attempt** any **three** questions out of remaining **five** questions.
(3) Assume suitable data if necessary and justify the same.

Q 1.	Answer the following questions a) Write the difference between attraction and repulsion type moving iron instrument. b) Write about piezoelectric transducer. c) Explain a De Sauty's bridge to measure the capacitance of capacitor. d) Define various types of errors in measuring instrument.	20
Q 2 a)	Discuss the construction and working of moving coil instrument and derive the equation of torque.	10
Q 2 b)	Explain the construction and working of single phase electrodynamometer type power factor meter.	10
Q 3 a)	Explain how D.C. potentiometer is used to calibrate the ammeter, voltmeter and wattmeter.	10
Q 3 b)	Explain the construction and working principle of thermistor.	10
Q 4 a)	Draw and explain working of successive approximation type digital voltmeter.	10
Q 4 b)	Explain the different types of torques required for operation of any indicating instruments.	10
Q 5 a)	Explain how Hay's bridge can be used to measure value of unknown inductor.	10
Q 5 b)	Explain the construction and working of Schering's bridge	10
Q 6 a)	Explain the construction and working of Thermocouple.	10
Q 6 b)	Write short note on Ballistic galvanometer.	10

SE - sem-III - Electrical - chole Based

Paper / Subject Code: 51005 / Electrical Machine-I

80/5/19

Duration: 3 Hours **Marks :- 80**

Please check whether you have got the right question paper.

N.B.: **1) Question 1. Is compulsory.**
2) Solve any three out of remaining question.
3) Assume suitable data if necessary.

Q.1	a)	Explain the use of commutator in DC motor.	05
	b)	Explain Armature Reaction in DC machine.	05
	c)	Explain difference Electric Circuit and develop circuit.	05
	d)	Explain the principle of energy conversion and develop the model of an Electromechanical energy conversion device.	05
	e)	Write the Applications of stepper motor.	
Q.2	a)	Explain the concept of singly excited machines and derive the expression for the electromagnetic torque.	10
	b)	Explain the electrical braking methods for DC motor.	10
Q.3	a)	A 230 V shunt motor running on no load and at normal speed takes an armature current of 2.5 Amp from 230V supply mains. The field circuit resistance is 230Ω and the armature circuit resistance is 0.3 Ω. Calculate the motor output and efficiency when total current taken from the mains is 35 Amp. If the motor is used as a 230v shunt generator. Find the efficiency and the input power for an output current of 35 Amp.	10
	b)	Write the short notes on Doubly excited magnetic field.	10
Q.4	a)	Explain the construction and working of permanent magnet stepper motor.	10
	b)	With the help of neat circuit diagram explain the swinburns Test.	10
Q.5	a)	Explain methods of speed control of DC motor.	10
	b)	The Hopkinson's test on two shunt machinery gave the following result for full load. Line voltage = 250V, current taken from supply system excluding field current = 50A, motor. Armature current = 380A, field currents =5A and 4.2 A. calculate the efficiency of the machine working as a generator. Armature Resistance of each m/c is 0.02Ω.	10
Q.6	a)	Explain four point starter.	10
	b)	Write down the applications of DC shunt and series motor.	10

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