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

School: SoET-CBSGS **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			
3	Conventional And Non-Conventional Power Generation	EEC303			
4	Electrical Networks	EEC304		✓	02
5	Electrical And Electronic Measurement	EEC305			

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)
Librarian, AIKTC

(3 Hours) [Total marks : 80

Note : -
1) Question number **1** is **compulsory.**
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1 a) Find the Laplace transform of $sinh^5 t$. 05

b) Find an analytic function whose imaginary part is $e^{-x}(y\cos y - x\sin y)$. 05

c) Find the Fourier series for $f(x) = 1 - x^2$ in $(-1, 1)$. 05

d) Evaluate $\int_C \bar{F} \cdot d\bar{r}$ where $\bar{F} = 2x\,i + (xz - y)\,j + 2z\,k$ from $O(0,0,0)$ to $P(3,1,2)$ along the line OP. 05

Q.2 a) Find a cosine series of period 2π to represent $\sin x$ in $0 \le x \le \pi$. 06

b) Find a, b, c if $\bar{F} = (axy + bz^3)\,i + (3x^2 - cz)\,j + (3xz^2 - y)\,k$ is irrotational. 06

c) Find the image of the circle $|z| = k$ where k is real under the bilinear transformation $w = \frac{5-4z}{4z-3}$. 08

Q. 3 a) Prove that $J_{\frac{1}{2}}(x) = \tan x \cdot J_{-\frac{1}{2}}(x)$. 06

b) Find the inverse Laplace transform of the following function by convolution theorem 06
$\frac{(s+2)^2}{(s^2+4s+8)^2}$.

c) Obtain the complex form of Fourier series for $f(x) = e^{ax}$ in $(-l, l)$ where a is not an integer. 08

Q. 4 a) Find the angle between the normals to the surface $xy = z^2$ at the points $(1,\ 4,\ 2)$ and $(-3,\ -3,\ 3)$. 06

b) Prove that 06
$x^2 J_n''(x) = (n^2 - n - x^2) J_n(x) + x J_{n+1}(x)$;
$n = 0, 1, 2, \ldots\ldots$

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c)

(i) Find the Laplace transform of $sinhat \sin at$. 04

(ii) Find the Laplace transform of $te^{-4t} \sin 3t$. 04

Q. 5 a) Prove that $J_2(x) = J''_0(x) - \frac{J_0'(x)}{x}$. 06

b) If $v = e^x \sin y$, show that v is harmonic and find the corresponding analytic function. 06

c) Find the Fourier series for $f(x)$ in $(0, 2\pi)$, 08

$$f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$$

Hence, deduce that

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

Q. 6 a) Show that the set of functions $\cos nx$, $n = 1, 2, 3, \ldots$ is orthogonal on $(0, 2\pi)$. 06

b) Using Green's theorem evaluate $\int_C \bar{F} \cdot d\bar{r}$ where C is the curve enclosing the region bounded by $y^2 = 4ax, x = a$ in the plane $z = 0$ and 06

$$\bar{F} = (2x^2y + 3z^2)\, i + (x^2 + 4yz)\, j + (2y^2 + 6xz)\, k.$$

c) Use Laplace transform to solve 08

$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1$ with $y(0) = 0, y'(0) = 1$.

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SE - Sem-III - CBSGS - Electrical

30/5/19

Paper / Subject Code: 49405 / ELECTRICAL NETWORKS

Time: 3 Hours **[Total Marks-80]**

N.B. **1. Question 1 is compulsory.**
2. Solve any three questions from remaining five.
3. Assume suitable data if necessary.
4. Figures to the right indicate full marks.

Q.1) a. Explain Reciprocity theorem with example. 5

b. Derive Unit impulse response of RC series circuit. 5

c. Test whether $P(s)= S^4+3S^2+5$ is Hurwitz. 5

d. Derive condition of symmetry for ABCD parameter 5

Q.2) a. For oriented graph shown in fig (1), Obtain incidence matrix, fundamental tieset and fundamental cutset matrix. 10

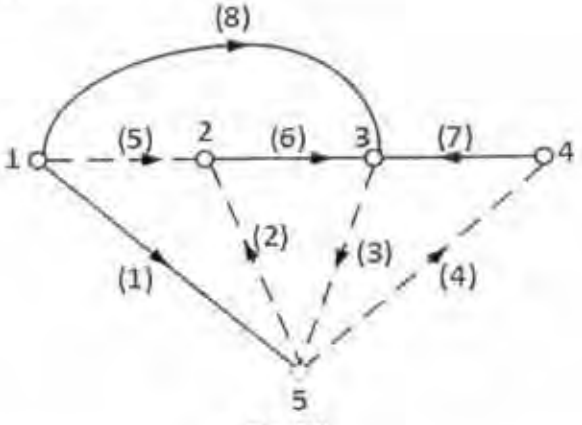

Fig. (1)

b. For network shown in fig. (2), determine voltage V_1 using Nodal analysis. 10

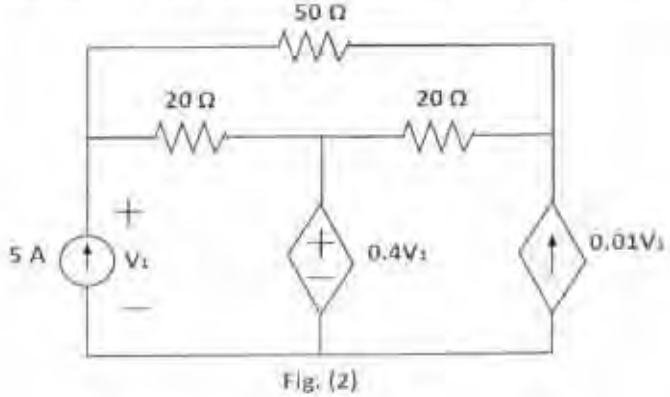

Fig. (2)

Q.3) a. In network shown in fig. (3), the switch is changed from position 1 to the position 2 at t=0, steady state condition having reached before switching. Find the values of i, di/dt and d^2i/dt^2. 10

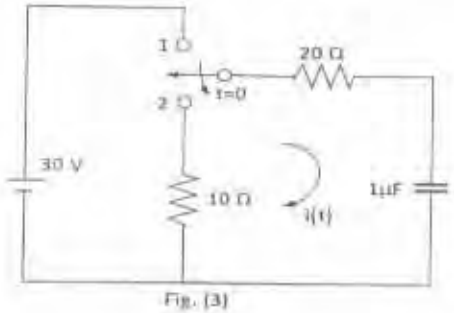

Fig. (3)

b. In network shown in fig. (4), a steady state condition is achieved with switch open. At t=0 switch is closed. Find $V_o(t)$. 10

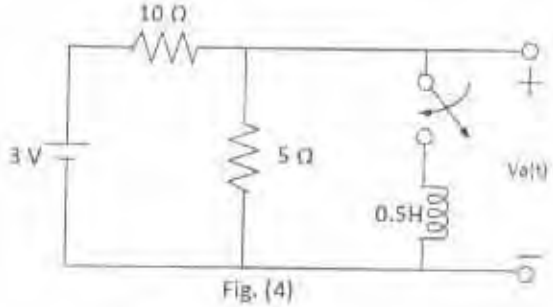

Fig. (4)

Q. 4) a. In network shown in fig. (5), the switch is moved from a to b at t=0. Using Laplace transform method. Determine i(t) and v(t). 10

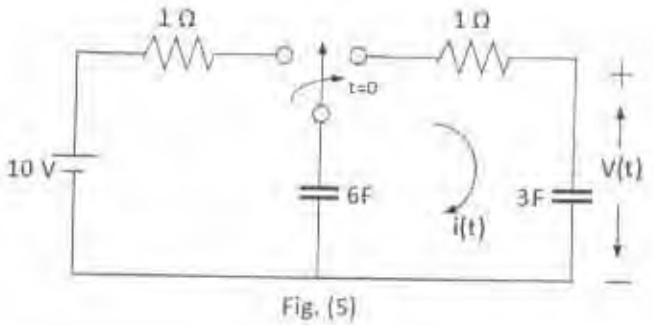

Fig. (5)

b. Find the value of load impedance Z_L for maximum power transfer in the network shown in fig. (6). Also find value of maximum power. 10

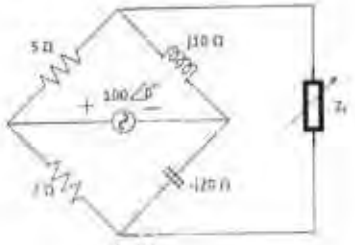

Fig. (6)

Q. 5) a. Determine voltage transfer function V_2/V_1 for network shown in fig. (7) 10

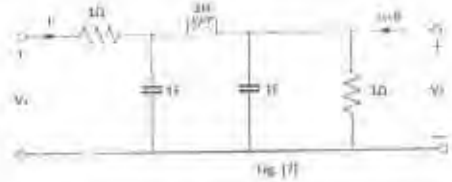

Fig. (7)

b. The pole zero diagram of the driving point impedance function and network are shown in fig. (8). At DC, the input impedance is resistive and equal to 2 Ω. Determine values of R, L and C. 10

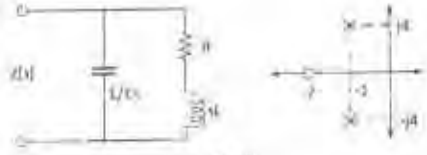

Fig. (8)

Q. 6) a. Obtain Z and Y parameters for the network shown in fig. (9). 10

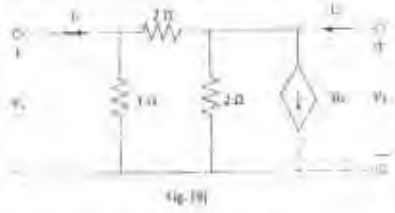

Fig. (9)

b. Determine the Foster form of realization of the RC impedance function 10

$$Z(s) = \frac{(s+1)(s+3)}{s(s+2)(s+4)}$$

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