ROLL NO. _____

**Code: DE107 Subject: NETWORKS AND TRANSMISSION LINES**

## DipIETE – ET (New Scheme)

**Time: 3 Hours** **JUNE 2017** **Max. Marks: 100**

***PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.***

**NOTE: There are 9 Questions in all.**

- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

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**Q.1 Choose the correct answer or best alternative in the following (2×10)**

a. Where is the ROC defined or specified for the signals containing causal as well as anti-causal terms?
**(A)** Greater than the largest pole **(B)** Less than the smallest pole
**(C)** Between two poles **(D)** Cannot be defined

b. Which result is generated/ obtained by the addition of a step to a ramp function?
**(A)** Step Function shifted by an amount equal to ramp
**(B)** Step function of zero slope
**(C)** Ramp function of zero slope
**(D)** Ramp Function shifted by an amount equal to step

c. $L[f''(t)]$ is:
**(A)** $S\,L[f'(t)-f(0)]$ **(B)** $F(s)$
**(C)** $SL[f(t)]$ **(D)** $F(s+a)$

d. What should be the value of Laplace transform for the time-domain signal equation $e^{-at}\cos \omega t.u(t)$?
**(A)** $a1/(s + a)$ with ROC $\sigma > -a$
**(B)** $\omega / \{(s + a)^2 + \omega^2\}$ with ROC $\sigma > -a$
**(C)** $A\omega / (s^2 + \omega^2)$ with ROC $\sigma > 0$
**(D)** $s + a /\{(s + a)^2 + \omega^2\}$ with ROC $\sigma > -a$

e. For high efficiency of transfer of power, internal resistance of the source should be
**(A)** Inversely proportional **(B)** less than the load resistance
**(C)** more than the load resistance **(D)** equal to the load resistance

f. Which operation is likely to get executed or performed by Millman's theorem in terms of converting the voltage or current sources into a single equivalent voltage or current source?
**(A)** Subtraction **(B)** Differentiation
**(C)** Combination **(D)** Integration

g. In a series RLC circuit that is operating above the resonant frequency, the current
**(A)** is zero **(B)** is in phase with the applied voltage
**(C)** lags the applied voltage **(D)** leads the applied voltage

h. A certain series resonant circuit has a bandwidth of 2 kHz. If the existing coil is replaced with one having a higher value of Q, the bandwidth will
**(A)** increase **(B)** be less selective
**(C)** decrease **(D)** remain the same

i. What is the meaning of the term velocity factor of a transmission line?
**(A)** The velocity of the wave on the transmission line multiplied by the velocity of the wave of light in vacuum.
**(B)** The ratio of the characteristic impedance of the line to the terminating impedance
**(C)** The index of shielding for coaxial cable
**(D)** The velocity of the waves on the transmission line divided by the velocity of light in a vacuum

j. What is the input impedance of a shorted lossless line of length wavelength/4?
**(A)** $Z_0$ **(B)** infinity
**(C)** 0 **(D)** complex

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**Answer any FIVE Questions out of EIGHT Questions.**
**Each question carries 16 marks.**

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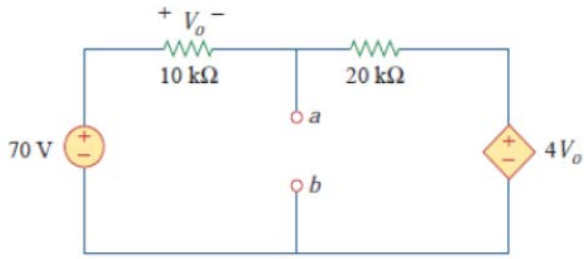
**Q.2** a. Find the Laplace transform of **(8)**

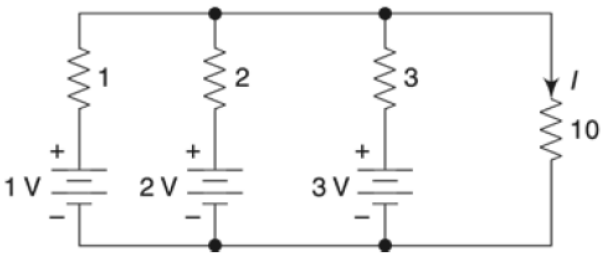
$$f(t) = \begin{cases} t^2 & 0 \le t \le 1 \\ sin2t, & 1 < t < \pi, \\ cost, & t > \pi \end{cases}$$

b. Find the Laplace transform of *t*cos(ωt)* **(8)**

**Q.3** a. Find the Thevenin Equivalent Voltage at terminals a-b of the circuit **(8)**

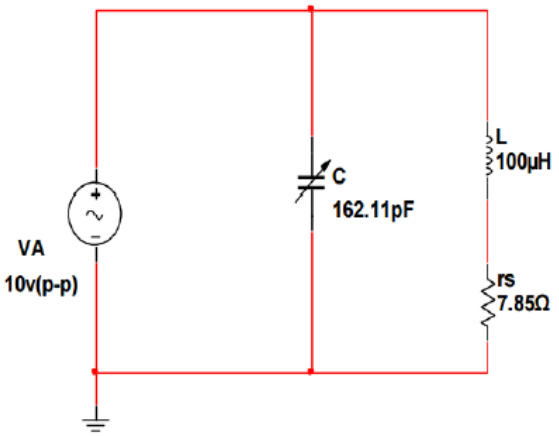



b. Find the Load current using Millman's theorem. All resistance values are in ohms **(8)**



**Q.4** a. The bandwidth of a series resonant circuit is 400 Hz.
(i) If the resonant frequency is 4000 Hz, what is the value of Q?
(ii) If R is 10 ohm then, what is the value of X at resonance?
(iii) Find the inductance L and capacitance C of the circuit. **(8)**

b. Find the value of Reonance frequency, Inductive reactance, Capacitive reactance, Total impedance of the circuit, Total current supplied by voltage source, Q factor, and band width of the given ciruit. **(8)**




**Q.5** a. A transmission line operating at 300 MHz has $Z_0$ = 60 ohm, $\alpha$ = 0.02 Np/m, $\beta$ = 0.6 rad/m Find the line parameters R, L, G, and C **(8)**

b. How does frequency distortion occur in a line? **(4)**

c Define the following
(i) Reflection Loss (ii) Reflection Coefficient **(4)**

**Q.6** a. A certain transmission line operating at $\omega = 10^6$ rad /s has $\alpha$ = 8dB/m, $\beta$ = 1rad/m and $Z_0$ = 60 + j40 ohm and is 2 m long. If the line is calculated to a source of $10 \angle 0°$ V, $Z_g$ = 40 ohm and terminated by a load of 20 + j50 ohm. Determine
(i) The input impedance
(ii) The sending end current
(iii) The current at the middle of the line **(10)**

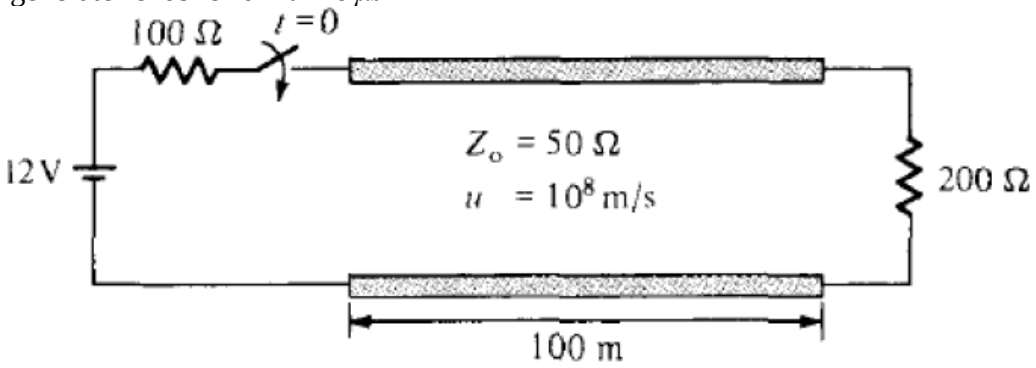
b. A single phase transmission line has two parallel conductors 3m apart, the radius of each conductor being 1 cm. Calculate the loop inductance per km length of the line if the material of the conductor is (i) copper (ii) steel with relative permeability of 100. ($\mu_r$ =1) **(6)**

**Q.7** a. Describe various characteristics of filters. **(8)**

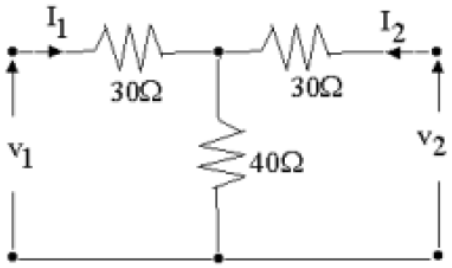
b. What are balance and unbalanced attenuators? **(8)**

**Q.8** a. Antenna with impedance 40 *+j30ohm* is to be matched to a 100ohms lossless line with a Shorted stub. Determine
(i) The required stub admittance
(ii) The distance between the stub and the antenna
(iii) The stub length **(10)**

b. For the given transmission line calculate and sketch the voltage at the load and generator ends for $0 < t < 6\ \mu s$ **(6)**




**Q.9** a. Find the z-and ABCD-parameters of given network and also prove the property of symmetry of the network **(8)**




b. Find the Y parameter of the given network **(8)**