(Long

Answer any *three* questions.

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Analog & Digital Electronics
(ELEC 2101)

Allotted : 3 hrs   Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.

dates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

ose the correct alternatives for the following: 10 x 1=10

he output impedance of a series voltage amplifier is
(a) $R_0 (1+A\beta)$.   (b) $R_0 / (1+A\beta)$.
(c) $\beta R_0 / (1+A)$.   (d) none of these.

An astable multivibrator generates
(a) triangular waveform.   (b) sinusoidal waveform.
(c) square waveform.   (d) none of these.

The output impedance of an Op-amp should be
(a) as small as possible.   (b) close to unity.
(c) close to zero.   (d) as large as possible.

An ideal regulated power supply should have regulation equal to
(a) maximum.   (b) zero.
(c) 75% .   (d) 50%.

o avoid false triggering of the NE555 timer, the RESET pin is generally connected to
(a) +Vcc.   (b) –Vcc.
(c) Ground .   (d) No connection.

NOR gate can be expressed as a gate
(a) producing output "1" when any one of its input is "0" else "0" .
(b) producing output "0" when any one of its input is "1" else "1" .
(c) producing output "1" when any one of its input is "1" else "0" .
(d) producing output "0" when any one of its input is "0" else "1".

Which expression is valid for NAND gate?
(a) NAND gate is equivalent to input inverted AND gate.
(b) Output inverted OR gate.
(c) Input inverted OR gate.
(d) None of the above.

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B.TECH/EE/3rd SEM /ELEC 2101/2015

(viii) To reduce logical expression, Karnaugh Map (K-Map) is preferable to
using Boolean rules because
    (a) K-Map does not require the rules to remember.
    (b) K-Map reduces the variable for adjacency.
    (c) both (a) and (b).
    (d) none of the above.

(ix) To express a large number more number of digits are required for
    (a) Hexadecimal system   (b) Decimal system
    (c) Binary system   (d) Octal system.

(x) Synchronous counter is preferable to ripple counter because
    (a) Synchronous counter clocks each stage simultaneously.
    (b) Design of ripple counter is complicated.
    (c) Synchronous counter receives clocks of higher frequencies as input.
    (d) None of the above.

Group – B

2.(a) Realize the following linear differential equation using Op-amp

$$\frac{d^3y}{dt^3} + 4\frac{d^2y}{dt^2} + 3\frac{dy}{dt} + 5y = 20$$

(b) In connection to the specifications of an Op-amp, explain the terms:
    i) supply voltage rejection ratio
    ii) offset voltage adjustment range.

(c) Explain the principle of operation of a differential amplifier using BJTs.

5 + (2

3.(a) Deduce the expressions of closed loop voltage gain for a
    i) voltage series feedback amplifier.
    ii) voltage shunt feedback amplifier.

(b) Design a practical integrator circuit to properly process input sinusoidal
from 10Hz to 1 kHz. The input amplitude is 10mV. Draw the complete
component values. Positive and negative saturation output voltages of the
12V and -12V respectively.

(c) Discuss about the problems in a basic differentiator circuit. How do we over
(3+3)

### Group – C

4. (a) Explain the working principle of a Hartley's oscillator with the help of a
diagram. Derive the expression of the frequency of oscillation.

EE/3rd SEM /ELEC 2101/2015

ne Schmitt trigger circuit has the following specifications:
= 100Ω, R_2 = 56kΩ , input voltage = 1V p-p sine wave, Op-amp is type 741 with
voltages = ± 15V. Determine the threshold voltages and draw the output
form. (For 741 the maximum output voltage swing is ± 14V)

w can we regulate the amplitude of the output voltage in a Schmitt trigger circuit?
mine the output voltage of the circuit given below:
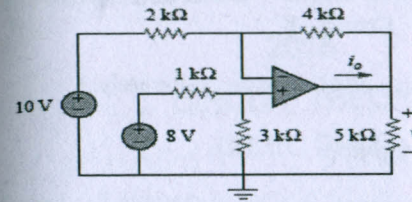
5 + 4 + 3 = 12

With the help of a block diagram explain the principle of operation of one-shot
tivibrator using
    i) Op-amp
    ii) 555 timer
the output voltage waveform and derive the expression for time period.

sing 7805C voltage regulator design a current source that will deliver 0.25A current
48Ω, 10W load.

(5+5) + (2) = 12

Group – D

nd the 9's complement and 10's complement for the following numbers : 7, 14, 83.

ibtract using 9's complement and 10's complement method: (13 - 7), (54 - 21),
95 - 154).

btract using 1's complement and 2's complement method: (1101_2 - 0111_2),
0110_2 - 11011_2).

nvert the following binary to Gray code: 1011_2, 10101_2.

3 + 3 + 4 + 2 = 12

te De Morgan's Theorems and realise in circuit.

aw the equivalent OR gate using NAND gates and equivalent AND gates using NOR

i) Write the truth table and transfer it into Karnaugh Map.
ii) Write the minimum SOP expression and realise the circuit.

(d) Design a 2 line to 4 line decoder.

2 + 2 + (2 +

Group – E

8.(a) Design SR flip-flop using NAND gates and NOR gates separately.

(b) Design J-K flip-flop from basic SR flip-flop.

(c) Draw the diagram for Master-Slave J-K flip-flop. State the operation briefly.

(d) Design a 4-bit ripple binary counter. Briefly explain its operation.

2 + 2 + 4

9.(a) Draw the circuit diagram for 4 bit R-2R ladder DAC.

(b) Explain the operation of TTL circuit.

(d) Explain the dual slope ADC with diagram.

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2015

CIRCUIT THEORY

(ELEC 2102)

Full Marks : 70

Time Alloted : 3 Hours

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable

GROUP - A
(Multiple Choice Type Questions)

Choose the correct alternatives for the following : **[10×1=10]**

i) Laplace transform of delayed unit impulse function $\delta(t - 1)$ is

(a) 1   (b) e^{-s}

(c) 0   (d) s

ii) When two inductive coils having self-inductance L_1, L_2 and mutual inductance M in between them are connected in series aiding, the equivalent inductance across the series combination will be

(a) $L_1 + L_2 + 2M$ (b) $L_1 + L_2 - 2M$

(c) $L_1 + L_2 + M$ (d) $L_1 + L_2 - M$

[Turn over]