CS/B.Tech/Even/Sem-2nd/ES-201/2015

WEST BENGAL UNIVERSITY OF TECHNOLOGY

ES-201

BASIC ELECTRICAL & ELECTRONIC ENGINEERING - II

Time Allotted: 3 Hours   Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

PART-I(Electrical)
(Used blue color answer book for this part)
GROUP A
(Multiple Choice Type Questions)

1.   Answer any *five* questions.   5×1 = 5

(i) The output voltage of a dc generator is

(A) ac square wave   (B) ac sinusoidal wave

(C) pulsating dc   (D) pure dc

(ii) In a transformer, the flux phasor

(A) leads the induced emf by 90°

(B) lags the induced emf by 90°

(C) leads the induced emf by slightly less than 90°

(D) lags the induced emf by slightly less than 90°

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(iii) When a 50 Hz transformer is operated at 400 Hz, its KVA rating is

(A) increased by 8 times

(B) reduced by 8 times

(C) unaffected

(D) determined by load on secondary

(iv) Two wattmeters are connected to measure the input to a balanced three phase circuit. The readings of the instruments are W_1 & W_2 respectively. The currents lag by an angle θ behind the corresponding phase voltages

(A) if $\theta = 0°$, $W_1 > W_2$

(B) if $\theta < 60°$ both W_1 & W_2 are positive

(C) if $\theta = 30°$, $W_2 > 0$

(D) for $\theta > 60°$, W_1 is positive

(v) Power developed by dc motor is maximum when the ratio of back emf & applied voltage is

(A) double   (B) zero

(C) unity   (D) half

(vi) The critical resistance of a dc generator refers to the resistance of

(A) load   (B) brushes

(C) field   (D) armature

GROUP B
(Short Answer Type Questions)

Answer any *two* questions.   2×5 = 10

2. Draw the exact equivalent circuit of a transformer & describe briefly the various parameters involved in it.

3. Find an expression of electric field intensity and electric potential of an isolated point charge.

4. Show that the power in a three phase circuit can be measured using 2 wattmeters.

5. What is slip? Deduce a relationship between rotor current frequency & supply frequency in terms of slip of an induction motor.

GROUP C
(Long Answer Type Questions)

Answer any *two* questions. $2 \times 10 = 20$

6. (a) Why is the open circuit test on a transformer conducted at a rated voltage? Explain. $3+7$

   (b) A 20 KVA, 2000/200V single phase transformer has a primary resistance of 2.1Ω and a secondary resistance of 0.02Ω. If the total iron loss equals 200W, find the efficiency on (i) full load & a p.f of 0.5 lagging (ii) half load & a p.f of 0.8 leading.

7. (a) What is meant by back emf? Explain the principle of torque production in a dc motor. 5

   (b) A dc motor takes an armature current of 100A at 230V. The armature resistance is 0.05Ω. The total number of lap connected armature conductors are 500 & the number of poles is 4. The flux per pole is 0.03wb. Find the speed & torque. 5

8. (a) "A rotating field is created in a three phase induction motor when a balanced three phase ac supply is applied at the stator". Explain. 5

(b) A three phase 4 kw, 400V, 50Hz, induction motor is working at full load with an efficiency of 90% at a power factor of 0.8 lagging. Calculate (i) the input power (ii) the line current.   5

9.(a) In a three phase four wire power distribution system, phase B is open while current through R & Y are 100 $\angle-30$ & 60 $\angle60°$. Find the current through the neutral connection.   4

(b) Three equal charges each of magnitude 3.5×10^{-6} C are placed at three corners of a right angled triangle of sides 3cm, 4cm, 5cm. Find the force on the charge at the right angle corner.   6

PART-II(Electronics)
(Used green color answer book for this part)
GROUP A
(Multiple Choice Type Questions)

1.　Answer any *five* questions.　　　　　　　　　　5×1 = 5

(i) FET is less noisy than BJT because of

(A) high input resistance 　　(B) low output resistance
(C) voltage controlled current 　(D) unipolar current

(ii) MOSFET is a

(A) current controlled device

(B) voltage controlled device

(C) temperature controlled device

(D) none of these

(iii) Current shunt feedback is used in

(A) voltage amplifier

(B) current amplifier

(C) transconductance amplifier

(D) transresistance amplifier

(iv) An OP-AMP has

(A) negligible input resistance

(B) infinitely large voltage gain

(C) very large output inpedance

(D) all of these

(v) The simplest form of Boolean expression $A \oplus \bar{A}B$ is

(A) A 　　　　　　(B) B
(C) AB 　　　　　　(D) A+B

(vi) What range of decimal values can be represented by an eight bit positive unsigned binary number

(A) 0 to 63   (B) 0 to 127

(C) 0 to 255   (D) 0 to 511

GROUP B
(Short Answer Type Questions)

Answer any *two* questions.   2×5 = 10

2. (a) What is the relation among JFET parameters?   2.5+2.5
   (b) What are the advantages of FET over BJT?

3. Deriving proper expression explain the effect of positive feedback on gain, input impedance, output impedance, stability and bandwidth.   5

4. Draw the block diagram of an OP-AMP and write down the characteristics of an ideal OP-AMP.   5

5. (a) Perform the following number conversion: 2.5+2.5
      (i) $(11011.1010)_2 = (?)_{10}$
      (ii) $(756.603)_8 = (?)_{16}$.
   (b) Realize the Boolean expression using minimum number of NOR gates
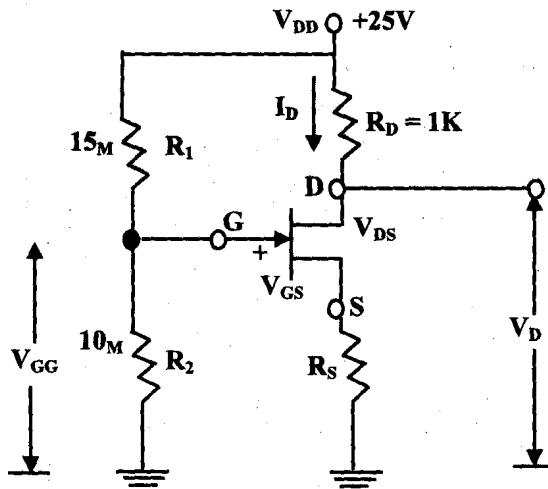 $Y = AB' + A'B$

GROUP C
(Long Answer Type Questions)

Answer any *two* questions. $\qquad$ $2 \times 10 = 20$

6. (a) An N-channel JFET amplifier with a voltage divider biasing circuit as shown in the figure has the following parameters: $V_p = -4V$, $I_{DSS} = 4mA$. Calculate the value of drain current at the operating point. Verify whether the FET will operate in the pinch-off region. $\qquad$ 7+3

(b) Explain the basic operation of depletion type *n* channel MOSFET with a suitable diagram.

SET 55 W/TURN 8P (744X494)

7. (a) Obtain the closed loop gain, CMRR in dB and maximum 5+2+3
operating frequency for the non-inverting amplifier shown in
the figure whose common-mode gain is 0.003 and slew rate is
0.2 V/μs.
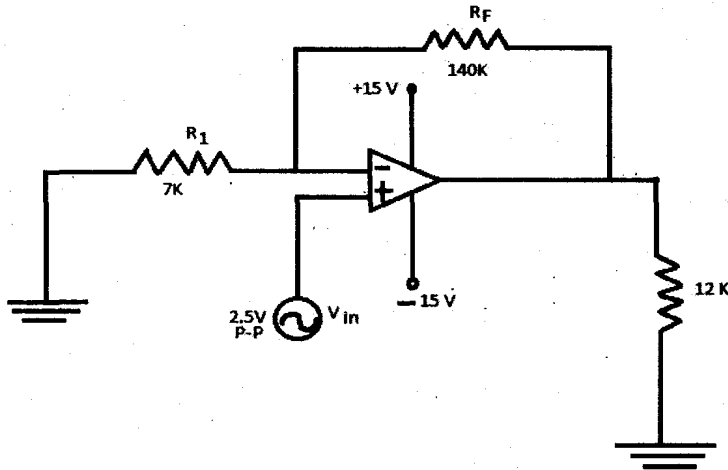
(b) What do you mean by negative feedback?
(c) Why is it used in designing an amplifier?

8. (a) Why NAND gate is called a 'universal' gate? Explain with 5+5
examples.
(b) A current series feedback amplifier has the following circuit
parameters: $R_L = 1K\Omega$, $R_E = 100\Omega$, $R_2 = 20k\Omega$, $R_1 = 30k\Omega$ and
$h_{fe} = 100$. Calculate A, β, R_{if}, A_f and loop gain in dB.

9. Write short notes on any two of the following: 2×5
(a) Slew rate
(b) Barkhausen criterion
(c) Pinch-off condition of JFET
(d) Op-amp as an integrator.