Roll No. _____

S-609

B.Sc. (Part-III) Examination, 2015

(Regular & Exempted)

PHYSICS

Third Paper

(Electronics)

Time Allowed : Three Hours] *[Maximum Marks : 75*

Note : Answer five questions in all, including Question No. 1, which is compulsory and one question from each of the Units I, II, III and IV.

keâue heebÛe ØeMveeVkeâe Gòej oerefpeS~ ØeMve meb 1 DeefveJeeÙe&nw leLee efIôÙekeââ FkeââF&I, II, III SJeb IV cemllmesSkeâ-Skeâ ØeMve keâe Gòej oerefpeS~

1. Answer each of the following questions:

eqecveefuecekâ FkeââF&eòeâ ØeMve keâe Gòej oerefpeS : $3 \times 10 = 30$

(i) Explain Thevenin's network theorem.
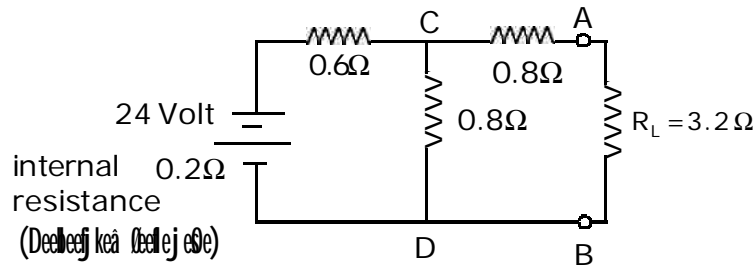
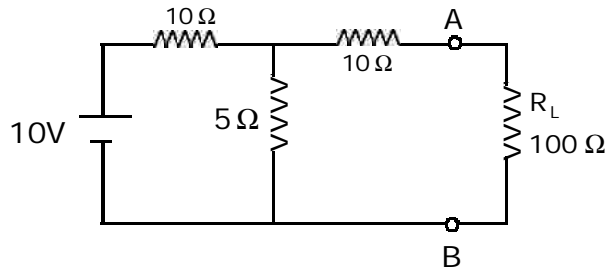LesefJeve ØeceSÙe keâes mecePeeFÙes~

Unit - I
FkeââF&- I

2. (a) State and prove Nortan's theorem. Draw Norton's equivalent circuit of the following circuit. Calculate the current in the load resistance R_L. 6

veeef^Sve ØeceSÙe keâeâs efueeKeS leLee efmeæ keâerefpeS~ Ghejebkeâ heefjheLe keâe veeef^Sve legyUe heefjheLe Keeröefòes leL Yeej Øeefleje0e R_L cebO0eeje keâer ieCevee keâerefpeS~

(b) Using Thevenin's theorem calculate current in the load resistance R_L in the following circuit. 5

Lesefefeve ØeceSUe keâe ØeUeesie keââjles nâ�§ Ghejebkeâ heefjheLe keâe Yeej ØeefleefjOe celW0eeje keââr ieCevee keâerefpeS~

(ii) Write down the expression for the char-acteristic impedance of T and π section filters. What is the difference between high pass and band pass filter?

T-Jeie& leLee π Jeie&eheâušjelWkeâ eíueS DeeVeuee#eeÕekeâ ÕeeñeyeeOee keâ JÙeòpekeâ eíueeKeS~ GÛÛe heeme eheâušj leLee yeÕ heeme eheâušj keâ DeeÕej mhe„ keââeepeS~

(iii) Explain diffusion and drift current for a semiconductor.

Skeâ DeLeÕeeeeuekeâ keâ eíueS eíemeejÇe leLee melïenve Oeeje keâ mhe„ keââeepeS~

(iv) In what respect an LED is different from an ordinary pn Junction diode? Give two applications of LED.

LED (ÕekeâeÕle GlmepeÕeâ [eÙees[) keâême metbYe&celWmeeOeejÇe pn metbOe [eÙees[meseÙeÙe níP LED keâ oesGheÙeeeie eíueeKeS~

(v) How FET is used as Voltage Variable Re-sistor?

FET keâes ekeââme ÕekeâejÇe JeeuušÙee DeeOeeeefjle ÕeefflejeOe keâÕ lejn ÕeúÙeâ ekeââÙee peelee níP

(vi) What is Base Width Modulation?

DeeOeej ÕeeñLeF&ceeÕegïeve keâÛlee nelee níP

(vii) Write down the expression of Stability

Factor of fixed current bias (Base bias) circuit. Why it is not capable of stabilising θ-Point?

efnLej Oeeje DeeÕeveeÕle (DeeOeej DeeÕeveeÕle) keâ mLeeÙeÙelJe ieÇÇeekeâ keâe JÙeàpekeâ eíueeKeS~ Ùen DeeÕeveeÕle θ-eÙevojÙkeâ mLeeÙeÙeer keââjÙ ves celWkeâbleeWmeceÛe&veïeÕ níP

(viii) Draw the circuit of Emitter follower. What is the value of feed back factor for this circuit?

TIlmepekeâ Deveïjeecceer keâ heefjheLe KeeñÕeÕeS~ Fve heefjheLe keâ eíueS heÙeÚe¥Ce ieÇÇeekeâ keâe ceeve keìlee nelee níP

(ix) What is the value of overall and collector efficiency for Direct coupled class A am-plifier? In Transformer coupled class A amplifier what is the value of overall effi-ciency?

mejue Ùeïjceve A Jeie&ÕeJeOekeâ keâ eíueS meceïe o#elee SJel meùeeener o#elee keâe keìlee nelee níP šÕÕeheheâÕeejcÕ Ùeïjceve A Jeie&ÕeJeOekeâ celWmeceïe o#elee keâe keìlee ceeve níP

(x) Write down two advantages and two dis-advantages of Integrated circuits.

Skeââkeââle heefjheLe keâ oesueeeYe leLee oesneeÙeÕeÙeJeÕlWkeâe GuueÕke keââeepeS~

leeheeÙe jveDeJeskeÙee nekeee nÏ DeeOeej DeeYeveeeele GlmeÛekeâ heyeYe&jÛe keâer JÙeekÙee keâeÀmeÙeeS ÙeLee Fmekeâ mLeeÙeelJe ieÇekeâ keâer ieÇevee keâeÀmeÙeeS~

Unit - I V
FkeâeF&- I V

8. Draw Drain characteristics and Transfer characteristics curves of JFET. Explain why drain current becomes constant in the Saturation region. Define parameters of FET. Establish a relation among them. **11**

meÙOe #e$e (íeYeeJe šÙÕohoemšj keâ efvekeââemeer DeeYeuee#eeÛekeâ leLee DevÙeuemÙe DeeYeuee#eeÛekeâ Je×eâÙkeââesDeejšKele keââesÙeâ meÙOe mecePeeÙeue nÏ FET keâ YeeÙeuemeÙÙkeââes heeÙÙeeefele keââesÙeâ SJeb Gvekeââ yeeeÛe cellmecyeevOe mLeeheele keââesÙeâ~

9. Write short notes on the following :
   (i) Zener diode as Voltage Regulator **3½**
   (ii) Selicon controlled Rectifier as a switch **3½**
   (iii) MOSFET **4**

efvecveeÙûKele hej meÙÙehle efŠheCeer efueÛKeS -
   (i) peÙÙej [eÙÙee Jeesšlee efveÙeeeÙekeâ keâer leÙn
   (ii) efmeefuekeââesâe keââvšÞesÙuš efoÛ keâejjeer SkeÂ efânÙûÙle keâer leÙn
   (iii) ceemeehoeÙš

3. (a) Design a low pass constant K filter for 600 ohm line to pass speech frequencies upto 2500CIS employing **5**
   (i) T - Section (ii) π - Section

   efvecveeÙûKele Ôekeââesj keââ efŠâušj Jeiee&ÙÙeÙeâ keââjjesnÝ 600 Deeme ueeFve keââ efueS Skeâ efvecve heeme efvyÙele K efŠâušj keââ jÛevee keââesÙeâ efpemekeââer DeeJee&ÙÙekeââes ieeÙ veskeââer GÛÛelece meeÛe 2500CIS nÙ

   (i) T - Jeiel (ii) π - Jeiel

   (b) Derive an expression for the width of depletion layer in a pn junction diode. Discuss how the depletion layer width depends on the concentration of impurity. **6**

   Skeâ pn meÙOe [eÙÙeeÙÝ keâ efueS DeJe#eÙe nele&keââ JÙebpe keââjÙÙheâe keââesÙeâ~ JÙeekÙee keââesÙeâ efkeâ DeJe#eÙe nele&keââer ÛeeÙIeeF&keââme ÍekeââesÙeâj DeMeefâÙe melevelee hej efveYe&â keââjjesnÝ

Unit - I I
FkeâeF&- I I

4. (a) What are Thermistors? Discuss their characteristics and give some of their applications. **5**

   leeheÙÙe ÍeefueejÙ kellee nekeee nÏ Fvekeââ DeeYeuee#eCeÙÙkeââer JÙeekÙee keââesÙeâ leLee Fvekeââ GheÙeesieÙÙkeâââ GuueÛKe keââesÙeâ~

(b) Give definition of four hybrid parameters. Draw hybrid parameter equivalent circuit of an amplefier in common base, common emitter and common collector configurations. 6

Ûeej ÚekeâÊj keâ mekeâêfjle ÛeÛeueeÚ/keâes heefjYeeefÍele keââeefÚpeS~ efkeââmeer ÚeJeOeÚkeââ keâ mekeâêfjle Úe/Ûeeue lesgÙUe heefjheLe GYÙeÚeefÚ%o DeeÚeej efÛeÚee, GYÙeÚeefÚ%o GImepeÚkeâ efÛeÚee leLee GYÙeÚeefÚ%o mekeener efÛeÚee ceÚkeeefÚeS~

5. (a) What are Tunnel Diodes? Draw their characteristic curve what are their applications? 5

meejjhe [eÚÚee[keâÚlee nelses nÚ(P Fvekeâê DeeÚeuee#eeÚkeâê Je>eâ KeeÚÚeÚeS leLee Fvekeâê GheÚeesieeÚWkeââe GuueÚke keââeefÚpeS~

(b) Derive the expression of concentration of electrons and holes in intrinsic semiconductors. Find out the position of Fermi level in the forbidden energy gap in intrinsic semiconductor. Show it in the energy band diagram. 6

Meege DeÚeÚÚeeuekeâ ceÚFueÚkeešÚÚe leLee efJeJejeÚWkeââer meeßÚlee keââe JÚehekeâê efveieeÚeÚe keââÚer keââer efnLeefle Jeepele Tpee&DeÚejeue ceÚ%eele keââeefÚpeS leLee Tpee&yeÚ[DeejKe ceÚWoMeefÚkeÚÚÚe~

Unit - III

FkeâeeF&- III

6. (a) Describe instability of θ–point and need of transistor biasing circuits. Describe Potential Divider biasing and derive the expression of its stability factor. 6

θ–efÚevogDeefnLej leLee leLeeleLee šõfBpemšj DeeÚeveeefÚe heefÚjheÚLeÚe keâêÚer DeeÚeJeÙUekeâÚeleLee keâÚÚer JÚeeKÚÚe keââÚeefÚpeS~ efÚeJeÚJeJe efÚ epekeâÚ DeeÚveeefÚe keâÚÚer JÚeeKÚÚe keââÚeefÚpeS leLee Fmekeâê mLeeeÚUelJe ieÚÇeÚkeâÚ keââer JÚefgheebe keââÚeefÚpeS~

(b) What are the main advantages of negative feed back amplifier. Prove mathematically that band width of an amplifier increases by the application of negative feed back. 6

$e+CeelcekeâÚ heÚeYeÚeJÚ{Ce keââ ceÚ{JÚbe ueeÚY keâÚÚlee n(P eeÚCeleÚeÚle ¤he ceWefmeea keââÚeeefÚpeS ekeââ $e+CeelcekeâÚ heÚeeYeÚeJÚ{Ce ÚeÚÙ{ÚeÚÇÚÚe keââÚjvesheÚj ÚeJeOekeâÚ keâÚÚer yeÚefC[ÚeeÚefÚeF&ÙeÚeKÚ{ peleee nÚÚ#

7. (a) Discuss the characteristics of class B Power amplifier. Calculate its efficiency. Describe Push-Pull class B amplifier. 6

Jeie&B MeeefÚÚe ÚeJeOekeâÚ keâ DeeÚveeeÚe#eeÚWkeâÚjJÚeeKÚee keââÚÚeefÚpeS~ Jeie& B keâÚ-eÚkeââ-eÚea ÚeJeOekeâÚ keââe JeCee keââÚÚeefÚpeS~

(b) What is Thermal Runaway? Describe Base bias with emitter feed back method of biasing. Derive the expression of its Stability Factor. 6