Khulna University of Engineering & Technology
B. Sc. Engineering 1st Year 2nd Term Examination, 2017
Department of Biomedical Engineering
Hum 1215
Technical English

Time: 3 hours   **Full Marks: 210**

N.B.   i) Answer **ANY THREE** questions from each section in separate scripts.
        ii) Figures in the right margin indicate full marks.

Section A
(Answer **ANY THREE** questions from this section in Script A)

1. a) Make sentences on the following structures using the words given in the brackets: (14)

    (i)   Sub + transitive verb + obj. + noun complement. (Declare as verb)
    (ii)   Sub + transitive verb + obj. + adj. complement. (Regard as verb)
    (iii)   Sub + transitive verb + infinitive as object. (Want as verb)
    (iv)   Sub + transitive verb + gerund as object. (Stop as verb)
    (v)   Sub + intransitive verb + adverb. (Run as verb)
    (vi)   Sub + linking verb + adj. complement + extension. (Be as verb)
    (vii)   Sub + linking verb + noun complement + extension. (Seem as verb)

    b) Change the following words as asked in brackets and make sentences with the changed forms: (12)
        Eviction (into verb), Lively (into noun), Atrocity (into adj.), Obduracy (into adj.), Wide (into noun), Behave (into noun).

    c) Make new words with the following suffixes and make sentences with the new words: (09)
        _____ate, _____ness, _____ly, _____ess, _____ism, _____ing.

2. a) Make W-H question with each of the underlined word/words of the following sentences: (14)

    (i)   You can attach a copy of your notes <u>for our information</u>.
    (ii)   She looked particularly lovely <u>that night</u>.
    (iii)   There seem to be <u>fewer tourists</u> around this year.
    (iv)   The water is only <u>a few inches deep</u>.
    (v)   A pale wintry sun shone <u>through the clouds</u>.
    (vi)   The nearest bank is <u>about three miles away</u> down the road.
    (vii)   Biology is <u>my favourite subject</u>.

    b) Make use of the following words in sentence as asked in brackets: (12)
        Baby (as verb), Daily (as noun), Sun (as adj.), Cloud (as verb), Father (as verb), Bed (as verb).

    c) Write a synonym and an antonym for each of the following words and use the new words in   (09)
        sentences: Confide, Pain, Suspect.

3. a) Correct the following sentences: (14)

(i)	He gave me a visit.	(v)	Sonchita by Nazrul revel a sense of love for
(ii)	I caught his hand.		humans.
(iii)	He that says finely is good.	(vi)	I expect to succeed.
(iv)	Air force is our pride.	(vii)	I hope it will take a month.

    b) Transfer the following sentences as asked in brackets: (12)

    (i)   Mim, a passionate boy, could hardly believe reason in life. (into complex)
    (ii)   Labib, who studies in KUET, feels an overwhelming sense of loss. (into simple)
    (iii)   As you are far away from me, I will send you a text message by email. (into simple)
    (iv)   His work is better than yours. (Positive)
    (v)   He is getting better and better. (Negative)
    (vi)   He has a lovely voice, so is popular. (Simple)

    c) Define present participle, infinitive and gerund with example.   (09)

4. a) Make sentence with the following modals as asked in brackets:

   (i) Shall. (To suggest somebody else)
   (ii) May. (Making a comment in a polite way)
   (iii) Dare. (To express indulgence)
   (iv) Must. (To express importance for something)
   (v) Should. (To express what is right)
   (vi) Would. (To express what you want to do)
   (vii) Would. (To express what you like)

   b) Express the following notions / functions in sentences: (12)

   (i) Cheerfulness, (ii) Sympathy, (iii) Worry, (iv) Surprise, (v) Determination, (vi) Desert.

   c) Fill in the gaps of the following sentences: (09)

   (i) My house is _____ about _____.
   (ii) He died _____ the wound _____ had received to his chest.
   (iii) A serious _____ nearly wrecked his _____.

Section B
(Answer **ANY THREE** questions from this section in Script B)

5. a) Read the following passage carefully and answer the questions that follow: (20)

Science has also relieved to a great extent human sufferings. Advances in the field of medicine and surgery have reduced the rate of infant and mother mortality. The average life span of man has increased. Today many of the dreaded diseases like cholera, small pox and even tuberculosis are easily curable. Surgery can remove malignant tumours and set the human body right in many other ways. Discovery of antibiotics has made the cure of infectious diseases very easy. Open heart surgery and treatment of even cancer have a possibility for medicine. Besides, it plays a great role in the communication. Travelling has become fast, safe and comfortable. Long distance can be covered by aero planes and fast moving trains. Cars, buses, rails and motor cycles have contributed to making men so much mobile. But inspite of the fact- science plays a great role in the advancement of the progression of life, it is also responsible for affecting the health of men. Establishment and expansion of different factories has resulted in all-round pollution. Pollution is taking its toil. The high rise chimneys, which belch out clouds of smoke and soot, pollute the atmosphere and air, causing diseases of bronchial tube and lungs. The increasing decibel value in the atmosphere affects the nervous system. Nervous strain makes men impatient, irritable and disquiet. Therefore should we do away with science and its discoveries and inventions? Should one throw away the baby with the bath-water? If science has made wars dangerous, it is not the fault of science as such. It is man's lust for power. His instinct to fight needs to be curved. Poison can be used to kill and cure disease. Similarly science can be used either for the welfare or for the destruction of his fellow beings. So we should use it for the welfare of human beings.

Questions:

   (i) What does science play a great role in the field of medicine?
   (ii) What scene do you find in communication for the role of science?
   (iii) What negative scene do you observe in health for science?
   (iv) What should we do with science?

   b) Make a precis of the above written passage (Question 5.a) with a suitable title. (15)

6. a) Write a paragraph on "Humanoid Robot Sophia" following the technique of listing. (15)

   b) Amplify the idea contain in the following: (20)
   Borrowed garments never fit well.

7. a) Suppose the Department of BME has offered an Internship course for the graduating students (15) in order to help them observe the application of their theoretical knowledge, enhance their occupational experience, get familiar with the industry and work conditions and do a conscious career decision after graduation. Prepare a memo on the basis of the given information.

   b) The United States Air Force is seeking a Biomedical Engineer who will be recruited under (20) Expedited Hiring Authority (EHA) for Defense Acquisition Workforce Positions and Health Care Occupations. Prepare your CV and apply for the post.

8. a) Write a composition on: (35)
   Animated Movies   Or   Virtual Culture

Khulna University of Engineering & Technology
B. Sc. Engineering 1st Year 2nd Term Examination, 2017
Department of Biomedical Engineering
Math 1215
Coordinate Geometry and Differential Equations

Time: 3 hours   **Full Marks: 210**

N.B.   i) Answer **ANY THREE** questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

Section A
(Answer **ANY THREE** questions from this section in Script A)

1. a) Find the transformed equation of $7x^2 - 6\sqrt{3}\,xy + 13y^2 - 16 = 0$, when the axes are rotated through an angle $30°$.   (11)

    b) Write the general equation of 2nd degree and also write the conditions for which it represents   (12)
    i)   A pair of straight lines
    ii)   A parabola
    iii)   A hyperbola
    Identify the conic $x^2 + 4xy + y^2 - 2x + 2y - 6 = 0$.

    c) Find the Cartesian and spherical polar coordinates for a point whose cylindrical polar coordinates are $(3, \frac{2\pi}{3}, 4)$.   (12)

2. a) Define direction cosines of a line. Determine the direction cosines of the line which lies on the xy-plane and makes equal angles with the x-axis and the y-axis. Also find the length of the projection of a segment joining the points $(1, 2, 3)$ and $(4, 5, 7)$ on the x-axis.   (13)

    b) Examine the four points $(0, 1, 2)$, $(3, 0, 1)$, $(4, 3, 6)$ and $(2, 3, 2)$ are coplanar or not. If they are non-coplanar, then find the volume of the tetrahedron whose vertices are those four points.   (12)

    c) Find the equation of the plane which passes through the points $(2, 2, 1)$ and $(9, 3, 6)$ and perpendicular to the plane $2x + 6y + 6z + 9 = 0$.   (10)

3. a) Define right-circular cone. Measure the semi-vertical angle of the right-circular cone represented by $2(y^2 + z^2) - x^2 = 0$ and also find it's axis.   (11)

    b) Find the ratio and the coordinates of the point in which the xy-plane divides the segment joining the points $(-2, 4, 7)$ and $(3, -5, 8)$.   (12)

    c) Find the distance from the point $(2, -4, 5)$ to the plane $2x + 5y + 6z = 11$ measured parallel to the line $\frac{x}{2} = \frac{y}{1} = \frac{z}{-2}$.   (12)

4. a) Define great circle. Find the equation of a sphere in which the circle $x^2 + y^2 + z^2 + 10y - 4z - 8 = 0$, $x + y + z - 3 = 0$ is a great circle.   (12)

    b) Show that the straight lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ are coplanar. Also find the equation of the plane containing them.   (10)

    c) Find the length and equation of the shortest distance between the lines $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ (13)
    and $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$. Also find the coordinates of the points where the shortest distance meets the given lines.

5. a) Define order of a differential equation with example. Find the differential equation for which (09) $xy = Ae^x + Be^{-x} + x^2$ is a solution, where A and B are arbitrary constants.

   b) Solve $\left(y + \sqrt{x^2 + y^2}\right)dx - xdy = 0$; $\quad y(1) = 0$. (13)

   c) Solve $x\frac{dy}{dx} + ylogy = xye^x$. (13)

6. a) Solve any three of the followings: (35)

   (i) $ydx - xdy = \sqrt{x^2 + y^2}dx$.

   (ii) $\frac{dy}{dx} + \left(\frac{2x+1}{x}\right)y = e^{-2x}$.

   (iii) $y = 3px + 6p^2y^2$, where $p = \frac{dy}{dx}$.

   (iv) $(D^3 - 2D^2 - 5D + 6)y = e^{3x}$ where $D = \frac{d}{dx}$.

7. a) Solve $\frac{d^2y}{dx^2} + 4y = 3e^x cos2x$. (11)

   b) Solve $(1 + x)^2\frac{d^2y}{dx^2} + (1 + x)\frac{dy}{dx} + y = sin2\{log(1 + x)\}$. (12)

   c) Solve $2\frac{\partial^2 z}{\partial x^2} - 5\frac{\partial^2 z}{\partial x\partial y} + 2\frac{\partial^2 z}{\partial y^2} = 24(y - x)$. (12)

8. a) Solve $\frac{\partial u}{\partial t} = 3\frac{\partial u}{\partial x}$; $u(x, 0) = 8e^{-2x}$. (11)

   b) Solve $2x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + (1 - x^2)y = 0$ by the method of Frobenius. (24)

Khulna University of Engineering & Technology
B. Sc. Engineering 1st Year 2nd Term Examination, 2017
Department of Biomedical Engineering
CSE 1215
Computer Programming

Time: 3 hours   **Full Marks: 210**

N.B.   i) Answer **ANY THREE** questions from each section in separate scripts.
        ii) Figures in the right margin indicate full marks.

Section A
(Answer **ANY THREE** questions from this section in Script A)

1. a) What is the basic difference between keyword and identifier? Write down the rules for (10)
        naming identifiers.

    b) Draw the structure of a C program and explain each part of it.   (09)

    c) Which type of programming language deals with hardware registers? Explain with proper (09)
        example.

    d) Why is switch statement used? Explain with proper example.   (07)

2. a) What are the differences between while & Do while loop?   (07)

    b) Describe the following two terms: (08)
        (i)   Bypassing in loops.
        (ii)   Skipping a part of a loop.

    c) Print the following output using a C program.   (10)

```
1
2 1
3 2 1
4 3 2 1
5 4 3 2 1
4 3 2 1
3 2 1
2 1
1
```

    d) Observe the following program: (10)
        int main ( )
        {
                int num1 = 1011;

                int num2 = 2011;

                int num3 = num2++ - num1;

                int num4 = ++num1 + num2;

        printf("a= %d\n b= %d\n c= %d\n d= %d\n", a, b, c, d);

                return 0;   }

    What will be the value of the four variables after executing above statements line by line?

3. a) Define the syntax and flow diagram of for loop.   (07)

    b) Write a C program to find the difference of two numbers. (N.B: Result must be positive (08)
        number)

    c) A function can be categorized depending on argument and return type- Explain this term with (10)
        proper examples.

    d) Write a C program to convert a given number of days in terms of years, weeks, and days. (10)

4. a) What do you mean by passing arrays to a function? Explain with proper examples. (08)

    b) Write a C program to find the Fibonacci series for a given number using recursion. (07)

    c) What is pointer to a function? Write down the advantages of using a function. (12)

    d) Define array with proper example. What is its significance? (08)

Section B
(Answer **ANY THREE** questions from this section in Script B)

5. a) What is the basic difference between array and structure? Write down the ways to access (11)
        structure variable with proper example.

    b) What is the purpose of union data type? Write an example of definition of union. (11)

    c) What do you mean by string handling function? Develop a C program which features all the (13)
        string handling functions.

6. a) Write down the basic differences between typedef and #define. (11)

    b) Write short notes on: (12)
        (i)   gets( )
        (ii)   puts( )
        (iii)   strcat( )

    c) Briefly explain different memory management functions available in C. (12)

7. a) Write down the basic structure of a class and mention how to create an object of that class. (11)

    b) What is file? Describe basic file operations with appropriate syntax and example. (12)

    c) Write a C program to store information of a student (including roll, name, marks, and grade) (12)
        in a file and find the size of the file.

8. a) Write short notes on: (12)
        (i)   Constructor.
        (ii)   Destructor.
        (iii)   Friend functions.

    b) Briefly explain different access specifiers supported by C++. (12)

    c) Write a C program to reverse a string by passing it to a function. (11)

Khulna University of Engineering & Technology
B. Sc. Engineering 1st Year 2nd Term Examination, 2017
Department of Biomedical Engineering

BME 1201
Biochemistry

Time: 3 hours   **Full Marks: 210**

N.B.   i) Answer **ANY THREE** questions from each section in separate scripts.
     ii) Figures in the right margin indicate full marks.

Section A
(Answer **ANY THREE** questions from this section in Script A)

1. a) Define carbohydrate. Classify Monosaccharide according to the number of carbon atom with   (10)
        example. Write down the functional group of Monosaccharide with chemical formula.

    b) Briefly discuss the digestion of carbohydrate with simple diagram.   (05)

    c) Write down the pathway of glycolysis in flowchart with energy yielding and expending.   (05)

    d) Write short notes on any three of the followings: (15)
        (i)   Isomers.
        (ii) Epimers.
        (iii) Enantiomers.
        (iv) Cyclization of monosaccharides.

2. a) Classify protein in different way with two examples.   (15)

    b) What is TCA cycle? Write down the others name of TCA cycle. Enumerate the steps of TCA   (10)
        cycle with the name of respective catalytic enzyme in a flowchart.

    c) Write down the three stages of catabolic pathway.   (05)

    d) What are the functions of protein?   (05)

3. a) Describe the various structures of protein with example and net sketch.   (15)

    b) What is electrophoresis? Write down the types of electrophoresis. What is the importance of   (10)
        electrophoresis?

    c) Briefly describe the properties of protein with example.   (05)

    d) What are the sources of protein? Write down the classification of amino acid according to the   (05)
        polarity of side chain with example.

4. a) What is Lipid? Classify Lipid with example.   (10)

    b) What is the structural unit of Lipid? Draw its chemical structure. Write down the physical   (10)
        properties of Lipid.

    c) What is cholesterol? Write down the flowchart of cholesterol synthesis.   (10)

    d) What is sphingolipids? Write down the structure of sphingolipids.   (05)

Section B

(Answer **ANY THREE** questions from this section in Script B)

5. a) What is enzyme? Classify enzyme with examples. (10)

   b) Write down the structural characteristics of m-RNA. (10)

   c) Write down the differences between DNA and RNA. (10)

   d) Write a short note on IPSC. (05)

6. a) What is ELISA? What are the basic principle of ELISA? Shortly explain the direct ELISA method. (15)

   b) Define PCR. What are the steps of PCR? Explain the medical significance of PCR? (10)

   c) What is nucleotide? Write down the basic chemistry of nucleotides. (10)

7. a) What is southern blotting? Write down the basic principles of southern blotting. Shortly explain the advantages of southern blot. (15)

   b) Mention the features of t-RNA. (10)

   c) What is vector? Write down the features of a vector. (05)

   d) Write short notes on: (05)
      (i)   Transcription
      (ii)   Translation

8. a) Enumerate the application of recombinant DNA technology. (10)

   b) Explain the competitive and non-competitive inhibition of enzyme. (10)

   c) Enumerate different kinds of stem cells with example. Write down the application of stem cells. (10)

   d) Write a short note on Chargaff's rule. (05)

Time: 3 hours   **Full Marks: 210**

N.B.   i) Answer **ANY THREE** questions from each section in separate scripts.
       ii) Figures in the right margin indicate full marks.

Section A
(Answer **ANY THREE** questions from this section in Script A)

1.   a)   Explain the operation of centre-tap full wave rectifier. Show that in half wave rectification, a   (09)
maximum of 40.6% of ac power is converted into dc power.

     b)   Define Doping, Fermi-level and Energy band diagram. Describe the formation of P-type Si   (08)
semiconductor with proper diagram.

     c)   Define and derive the expression of Ripple factor. Also show that the ripple factor of half-   (09)
wave and full-wave rectifier are 1.21 and 0.48 respectively.

     d)   A crystal diode having internal resistance of $r_f = 20\Omega$ is used for half-wave rectification. If   (09)
the applied voltage is $V = 50 sin\omega t$ and load resistance $R_L = 800\Omega$. Find

            (i) $I_m, I_{dc}, I_{r.m.s}$ (iii)   D.C output voltage.
            (ii)   A.C and D.C power.   (iv)   Efficiency.

2.   a)   Draw symbols and two applications of each of the following diodes: (08)

            (i)   Tunnel diode.   (iii)   Shockley diode.
            (ii)   Varactor diode.   (iv)   Opto-isolator.

     b)   Write down the necessity of regulated power supply. Draw a regulated power supply of -15V   (10)
with π-filter and also show the waveforms at various stages of that supply.

     c)   Show the equivalent circuit of zener diode and also show that zener diode can act as a voltage   (09)
regulator.

     d)   Draw the DC and AC equivalent circuit of the following Fig. 2(d)   (08)
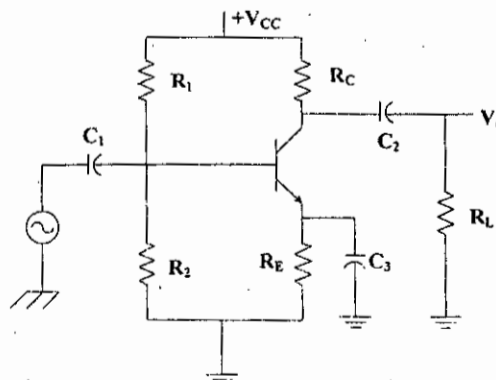

Fig. 2(d)

3.   a)   Define stabilization. Derive the expression of stability factor of a transistor.   (07)

     b)   What do you mean by transistor biasing? Describe the conditions for faithful amplification   (08)
of a transistor.

c) Calculate the base current of the following Fig. 3(c). Also calculate the value of V_{CE}, V_C and (11) V_{BC} of the circuit.
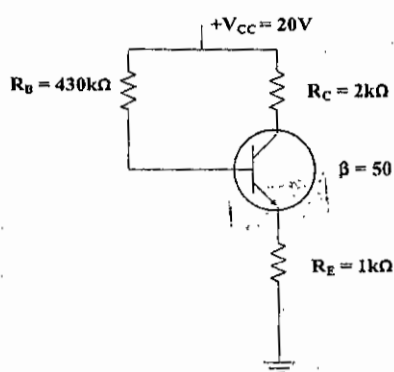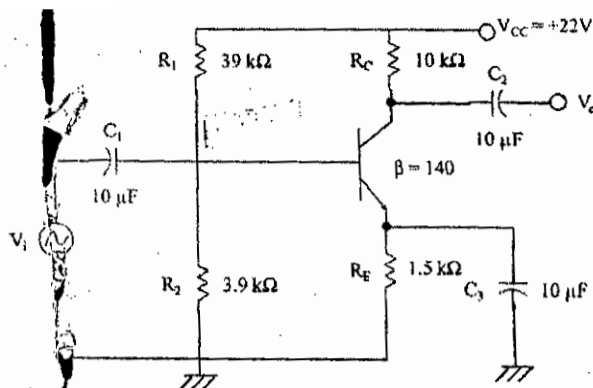

Fig. 3(c)   Fig. 3(d)

d) Calculate the emitter current in the voltage divider circuit shown in above Fig. 3(d). Also (09) find the value of V_{CE} and collector potential V_C.

4. a) What are the differences between BJT and FET? Classify FET devices with appropriate (12) symbols. Also explain the operating characteristics of n-channel JFET.

b) Draw the construction of n-channel D-MOSFET and E-MOSFET. Write down the difference (08) between them.

c) Determine the followings for the network shown in Fig. 4(c). (10)

    (i) V_{GSQ} (iv) V_D
    (ii) I_{DQ} (v) V_G
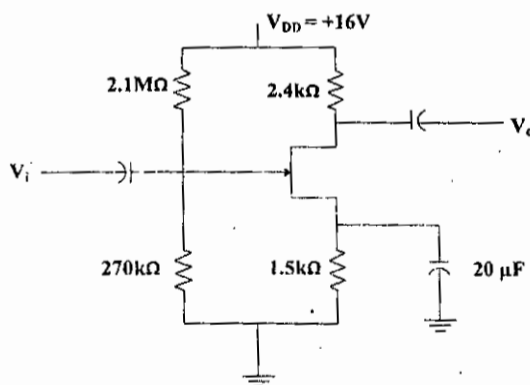   (iii) V_{DS} (vi) V_S

Fig. 4(c)

d) Draw the transfer characteristic curve of n-channel D-MOSFET and E-MOSFET. (05)

Section B

(Answer ANY THREE questions from this section in Script B)

5. a) What do you mean by operational amplifier? Explain the concept of virtual grounding. (07)

b) Derive the equation of close loop gain of inverting amplifier. How can we convert an (10) inverting amplifier into a summer circuit? Explain.

c) Suppose you need to monitor a signal from a part of the body of a patient. The voltage of that (08) signal should not exceed 0.1V. Design a circuit that will let you know when the signal from that part of the body exceeds 0.1V using Op-amp.

d) Derive the output equation of an integrator using Op-amp. Also draw the output, V_o of (10)
Fig. 5(d) using exact time scale with input, V_{in}, given that $R_1C_F = 1$ second.
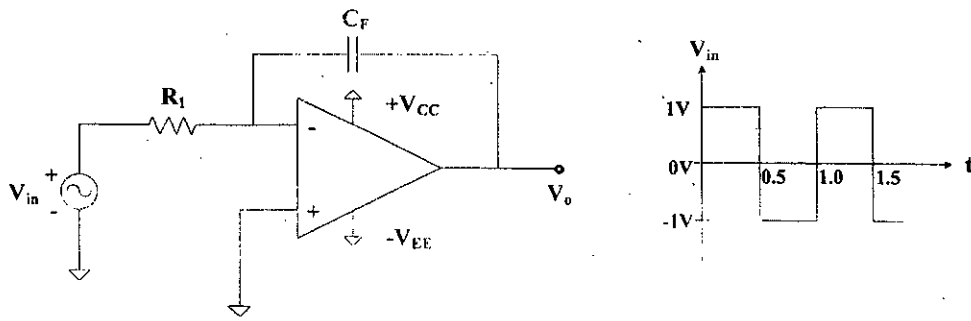

Fig. 5(d)

6. a) Design a second order low pass Butterworth filter with cut-off frequency of 1kHz. (08)

b) What do you mean by small signal analysis? Draw the r_e-equivalent model of a common (10)
emitter voltage divider bias configuration and derive the equation of input impedance, output
impedance and gain.

c) Draw the two transistor model of a SCR and explain its operation. (10)

d) Determine the maximum and minimum peak-point voltage for a UJT with $V_{BB} = 25V$. Given (07)
that UJT has a range of $\eta = 0.74$ to 0.86.

7. a) Define collector efficiency. Show that the maximum collector efficiency of a class B (13)
amplifier is 78.5%.

b) Explain the operation of transformer coupled push-pull amplifier and explain its cross-over (12)
distortion.

c) Differentiate between voltage and power amplifier. The circuit shown in Fig. 7(c) uses (10)
variable resistor R_E to change the frequency of pulses delivered at V_{out}. The variable resistor
is initially set at 5kΩ and then adjusted to 10kΩ. Determine the frequency of voltage spikes
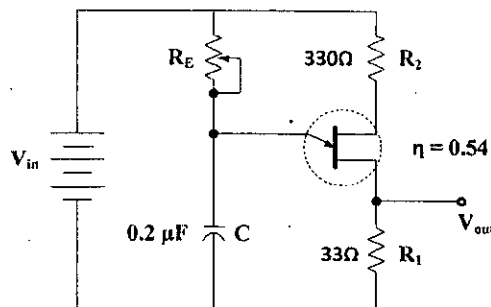produced for (i) 5kΩ setting and (ii) 10kΩ setting.

Fig. 7(c)

8. a) What do you mean by feedback? Classify it. Also explain the advantages of negative (08)
feedback.

b) Define sinusoidal oscillator. "An oscillator must maintain the Barkhausen criterion to give a (08)
continuous undamped oscillation"- explain the statement.

c) Explain the operating principle of Colpitt's oscillator. (09)

d) When negative voltage feedback is applied to an amplifier of gain 100, the overall gain falls (10)
to 50.
    (i) Calculate the fraction of output voltage feedback.
    (ii) If the fraction is maintained, calculate the value of the amplifier gain required if
    the overall stage gain is to be 75.