

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2017
CE 1123
(Surveying)

Full Marks: 210

Time: 3 hrs

- N.B.** i) Answer any three questions from each section in separate script.
 ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Define the term 'surveying'. Why surveying is important in any engineering project? (07)
- (b) Distinguish between: (i) plan and map; (ii) check line and tie line. Describe the working principle of an optical square with neat sketch. (15)
- (c) An old map was plotted to a scale of 40 m to 1 cm. Over the years, this map has been shrinking and a line originally 20 cm long is only 19.5 cm long at present. Again, the 20 cm chain was 5cm too long. If the present area of the map measured by planimeter is 125.50 cm², find the true area of the land surveying. (13)

2. (a) Write down the objectives of levelling. Define: (i) Datum (ii) RL (iii) MSL (iv) Geoid. Describe temporary adjustment of level with proper illustration and notations. (15)
- (b) Deduce $h = \frac{(a_1 - b_1) + (a_2 - b_2)}{2}$ where symbols bear usual meaning. (20)

The following consecutive readings were taken with a level and 5 m levelling staff on a continuously sloping ground at a common interval of 30 m.
 0.385; 1.030; 1.925; 2.825; 3.730; 4.685; 0.625; 2.005; 3.110; 4.485; (meters).
 The RL of first point is 208.335 m. Rule out the level book and enter above readings. Calculate RL of all points and find gradient of the line connecting first and last point.

3. (a) Write down the uses of contour map. A 3x3 grid with following RL found from a survey. Each grid with dimension 5 m x 5 m. Draw the contour lines of 98, 99, 100 and 102 with proper legend. (15)
- (b) Describe the Simpson's one-third rule with neat sketch. A railway embankment of formation width 8m and side slope 2:1 to be constructed. The ground level along the centerline is as follows: (20)

| | | | | | | |
|-----------|--------|--------|--------|--------|--------|--------|
| Chainage: | 0 | 50 | 100 | 150 | 200 | 250 |
| GL (m): | 115.75 | 114.35 | 116.80 | 115.20 | 118.50 | 117.50 |

The embankment has a rising gradient of 1 in 100 and the formation level at zero chainage is 115. Assuming the ground level is level across the center line, compute the volume of earthwork.

4. (a) When do you recommend plane table survey? What are the disadvantages of such survey? Briefly describe radiation and intersection methods with neat sketch. (15)
- (b) Define: (i) Great circle (ii) Celestial sphere (iii) Zenith and Nadir (iv) Ecliptic. (20)

An observer was 30 ft above the level of sea. An observation was made on the sun using the lower limb and reading was 46° 40' 25" with face left. The semi-diameter of sun at time of observation was found to be 15' 58.7". The face left and right observations of the theodolite on the top of an electric tower were 12° 15' 56" and 12° 13' 42" respectively. Find net correction and true altitude of sun.

Section – B

- (5) (a) Write down the characteristics of a closed traverse. (05)
- (b) Define closing error. Describe the graphical method for balancing the closing error. (10)
- (c) Calculate the independent co-ordinate of stations A, B, C, and D of the closed traverse ABCDA from the following data: (20)

| Side | Length (ft) | Bearing |
|------|-------------|----------|
| AB | 300 | 260° 15' |
| BC | 900 | 190° 30' |
| CD | 600 | 80° 45' |
| DA | 849 | 351° 0' |

6. (a) Define tacheometry. What are the tacheometric constants? How are they determined? (09)
- (b) Derive the expression of distance and height for inclined sight when the staff is held vertical. (11)
- (c) The following observations were made with an anallactic tacheometer with the staff being vertical. The constant of the instrument is 100. (15)
- If the R.L of the B.M. was 585.40 ft, calculate the horizontal distances AB and BC and also determine the R.L. of A, B and C.

| Instrument station | Height of the instrument axis (ft) | Staff position | Vertical angle | Stadia reading |
|--------------------|------------------------------------|----------------|----------------|------------------|
| A | 4.80 | B. M. | -5° 30' | 3.02, 5.76, 8.50 |
| A | 4.80 | B | +3° 24' | 3.12, 5.58, 8.04 |
| B | 4.60 | C | +6° 12' | 2.94, 6.46, 9.98 |

7. (a) Define (i) Aerial photogrammetry (ii) Photo mosaic (iii) Flying height (iv) Photo scale (v) Project surveying (vi) House setting (15)
- (b) Show that the height displacement of a point is proportional to its height above MSL and the distance to its top image from plump point. (10)
- (c) Photographs at a minimum scale of 1:6000 are to be taken for a border road design map of a hilly area having elevation ranges from 160 m to 2000 m. If the focal length of the camera lens is 140 mm, what is the flying height of the aircraft above MSL? What will be the largest scale? (10)
8. (a) Mention the important operations of total station in surveying. What are the advantages of using total station over other conventional surveying instrument? (09)
- (b) Define (i) Local attraction (ii) Inclination. Write short notes on remote sensing, GPS and GIS with application. (13)
- (c) To find the elevation of the top (A) of the minar of KUET mosque, observations were made from two stations P and R, 50 m apart. The horizontal angle measured at P between R and the top of the minar was 60° 45' and that measured at R between the top of the minar and P station was 72° 30'. The angle of elevation of the top of the minar was measured to be 20° 17' at R and that was 20° 48' at P. Stadia readings on B.M. When the instrument was at P = 2.969 m and that with the instrument at R = 3.073 m. Calculate the elevation of the minar of KUET mosque if that B.M. was 420m. (13)

Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management

B. Sc. Engineering 1st Year 1st Term Regular Examination, 2017

Ch 1123
(Chemistry)

Full Marks: 210

Time: 3 hrs

- N.B.** i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Classify corrosion into different classes. Illustrate dry corrosion with some examples. (08)
- (b) What is spontaneity of a corrosion reaction? How can it be determined? Discuss with suitable examples. (10)
- (c) With help of a diagram describe the effect of different factors on atmospheric corrosion? (10)
- (d) What is pitting corrosion? How is it formed? (07)

2. (a) Discuss the factors that enhance the rate of under water and soil corrosion in Khulna region. (10)
- (b) Write the name of units of corrosion that are usually used. Define them (05)
- (c) Briefly describe different methods of prevention of corrosion. (15)
- (d) Zinc is more readily corroded, when coupled with copper than with lead, why? (05)

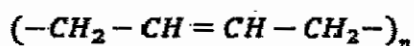
3. (a) Define paint. Distinguish between paints and varnishes. (07)
- (b) What are the various constituents of a paint? Give examples and functions of each constituents. (10)
- (c) "Pretreatment of surface" is essential before painting. Explain it. (08)
- (d) Write short notes on:
 - (i) Hot- dip process (10)
 - (ii) Electro plating

4. (a) What is meant by the viscosity of a liquid? In what units is viscosity expressed? (07)
- (b) Define Adhesion and cohesion with suitable examples. What is fluidity? (08)
- (c) What is meant by vapor pressure of liquids at a given temperature? Graphically represent the relationship between vapor pressure and temperature. (10)
- (d) Write short notes on: (10)
 - (i) Boiling point of a liquid.
 - (ii) Surface tension.

Section – B

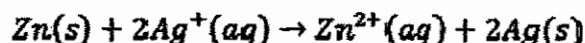
- 5 (a) What are silicates? Discuss the structural pattern of silicates. (13)
(b) Define Portland cement. Write the general composition of Portland cement. (07)
(c) Mention the thermo-chemical changes occurring at different temperatures during cement manufacturing. (05)
(d) Explain the setting and hardening of cement (10)

- 6 (a) Classify polymers from different points of view. (10)
(b) What are three main steps of polymerization reaction? Describe them in brief with suitable examples. (10)
(c) Define oligomer. Deduce plausible monomers for polymers with the following repeating units (07)



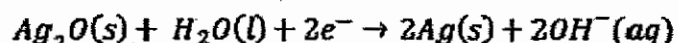
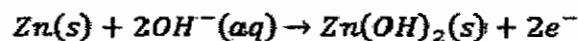
- (d) Calculate the number average molecular weight of a sample of nylon having 1000 molecules of 5000; 2000 molecules of 6000 and 4000 molecules of 1000 molecular weight. (08)

- 7 (a) What is oxidation half reaction and reduction half reaction? Zinc reacts spontaneously with silver ion. (12)



Describe a voltaic cell using this reaction. What are the half reaction?

- (b) A silver oxide-zinc cell maintains a fairly constant voltage during discharge (1.60V) (08)
The button form of this cell is used in watches, hearing aids, and other electronic devices. The half reactions are.



Identify the anode and the cathode reactions. What is the overall reactions in the voltaic cell?

- (c) What is pH? Describe the method for the determination of pH of a solution using hydrogen electrode. (10)
(d) What is a salt bridge? Why is it used? (05)

- 8 (a) Define the terms "adsorbent" and "adsorbate".. (06)
(b) Write the assumptions of Langmuir adsorption isotherm and derive the equation pertaining to it. (12)
(c) Discuss the effect of temperature on adsorption of gases on solids. (08)
(a) How is the formation of the multilayer explained and how can it be detected from Langmuir isotherm? (09)

Khulna University of Engineering & Technology
 Department of Building Engineering and Construction Management
 B. Sc. Engineering 1stYear 1stTerm Regular Examination, 2017
Math1123
 (Mathematics-I)

Full Marks: 210

Time: 3 hrs

- N.B.** i) Answer any three questions from each section in separate script.
 ii) Figures in the right margin indicate full marks.
 iii) Assume reasonable data if missing any.

Section – A

1. (a) Show that $\lim_{x \rightarrow 0} \frac{2x^2 - 8}{x - 2} = 8$. Applying (δ, ϵ) definition, find δ if $\epsilon = 1$. (10)
- (b) Define continuity of a function at a point. Mention some properties of continuous functions. (05)
- (c) Test the differentiability and continuity of the function (10)
- $$f(x) = \begin{cases} \frac{x - |x|}{x} & \text{when, } x \neq 0 \\ 0 & \text{when, } x = 0 \end{cases}$$
- at the point $x = 0$.
- (d) Find $\frac{dy}{dx}$ if (10)
- (i) $y = (\sin x)^{\cos x} + (\cos x)^{\sin x}$.
- (ii) $x = a(2 \cos t + \cos 2t)$, $y = a(2 \sin t - \sin 2t)$.
2. (a) Find y_n , where $y = \frac{x}{x^2 + a^2}$. (10)
- (b) State the Leibnitz's theorem. Use this theorem to evaluate the value of $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n$ if $y = a \cos(\ln x) + b \sin(\ln x)$. (15)
- (c) State the Mean Value Theorem. Find the value of θ in the Mean Value Theorem $f(x+h) = f(x) + hf'(x+\theta h)$, if $f(x) = e^x$. (10)
3. (a) Justify the validity of the Rolle's theorem to $f(x) = 2f(x-1)^{\frac{2}{3}}$ in the interval $[0,2]$. (11)
- (b) Discuss the maxima and minima of the function $x^3 + y^3 - 3x - 12y + 20$. (12)
- (c) Evaluate $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x}\right)^{\frac{1}{x}}$. (05)
- (d) If $u = z \tan^{-1}\left(\frac{y}{x}\right)$, then evaluate the value of $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$. (07)

4. (a) Expand $\cos x$ in power of $(x - \frac{\pi}{2})$ by using Taylor's theorem. (10)

(b) Determine the Fourier series expansion of the periodic function $f(x)$ of period 2π , if

$$f(x) = x^2, \text{ for } -\pi \leq x \leq \pi.$$

And hence show that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$

(c) Find the Fourier series of the function of period 2ω given below in the interval $-\pi < x < \pi$ as follows: (13)

$$f(x) = \begin{cases} 0 & \text{when } -\pi < x \leq 0 \\ \sin x & \text{when } 0 < x \leq \pi \end{cases}$$

Section – B

5. (a) Evaluate any three of the followings: (35)

a) $\int \frac{dx}{x^2(a+bx)^3}$

b) $\int \frac{x^2 - x + 1}{x^2 + x + 1} dx$

c) $\int e^x \frac{x^2 + 1}{(x+1)^2} dx$

d) $\int \frac{3 \sin x - 4 \cos x - 5}{2 + \cos x - 2 \sin x} dx$

6. (a) Evaluate the followings: (20)

i) $\int_a^\beta \frac{dx}{x\sqrt{(x-\alpha)(\beta-x)}}$ (ii) $\int_0^{\frac{\pi}{2}} \ln(\sin x) dx$

(b) Find reduction formula for $I_{m,n} = \int \cos^m x \sin nx dx$ and deduce the value of (15)

$$\int_0^{\frac{\pi}{2}} \cos^5 x \sin 3x dx$$

7. (a) Represent $\sum_{r=1}^n \frac{n}{(n+r)\sqrt{r(2n+r)}}$ as a definite integral and then (10)

evaluate the value of this integral.

(b) Establish the Legendre duplication formula $\Gamma(2m-1)\Gamma(m)\Gamma(m+\frac{1}{2}) = \Gamma(2m)\sqrt{\pi}$. (13)

(c) Find the entire length of the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$. (12)

8. (a) Find the volume and the surface area of the solid generated by revolving the (12)

ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about x-axis.

(b) In the spherical triangle ABC, $\angle C = 90^\circ$, $a = 119^\circ 46' 36''$ and $\angle B = 52^\circ 25' 38''$. (11)
Solve the triangle ABC.

(c) Find the great circle distance between two places Boston ($42^\circ 22' N, 71^\circ 4' W$) (12)
and Wellington ($41^\circ 8' S, 174^\circ 46' E$).

Khulna University of Engineering & Technology
Department of Building Engineering & Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2017
Ph 1123
(Physics-I)

Full Marks: 210

Time: 3 hrs

- N.B. i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) How would you define high temperature and low temperature? Mention the different methods employed in high and low temperature thermometry. (10)
- (b) Describe a constant volume hydrogen thermometer. How would you use it to measure temperature? Discuss the various sources of error that are involved in the measurement of temperature by this thermometer and the conditions necessary. (15)
- (c) The resistance of a platinum wire at 0 °C, 100 °C and 445 °C are found to be 6.0, 8.5 and 15.5 Ω respectively. The resistance of a wire at a temperature t °C is given by the equation $R_t = R_0(1 + \alpha t + \beta t^2)$. Find the value of α and β . (10)
2. (a) Define and explain thermal conductivity and thermometric conductivity. Describe and explain cylindrical shell method of determining the conductivity of a solid. (13)
- (b) Define thermal conductivity. Show that in the steady state of a metal bar heated at one end $\frac{d^2\theta}{dx^2} = \mu^2\theta$, where the symbols have their usual meanings. (12)
- (c) Heat is conducted through a slab of two slices of different materials of thermal conductivity 0.25 and 0.55 respectively. The thickness of each slice is 2.1 cm. If the temperatures of the two outer surfaces are 100 °C and 0 °C, find the temperature of the interface. (10)
3. (a) What are the differences between 1st law and 2nd law of thermodynamics? Show how the work done in each operation of Carnot's engine is represented on a P-V diagram. (13)
- (b) Define entropy. Obtain an expression for the change of entropy of a gas when it is heated in a regular manner. (12)
- (c) A Carnot refrigerator takes heat from water at 0°C and discards it to a room at 27°C. 1kg of water at 0°C is to be changed into ice at 0 °C. (i) How many calories of heat are discarded to the room? (ii) What is the work done by the refrigerator in this process? (10)
4. (a) Distinguish between elastic and plastic materials. Explain the terms: Yield point, elastic limit, elastic fatigue and breaking stress. (10)
- (b) What is a cantilever? Obtain an expression for the depression at the free end of a thin light beam clamped horizontally at one end load at the other. Neglect the weight of the cantilever. (15)
- (c) Calculate the depth of water at which an air bubble of radius $4 \times 10^{-4} m$ may remain in equilibrium. Surface tension of water = $70 \times 10^{-3} \frac{N}{m}$. (10)

Section – B

5. (a) Discuss nonlinear nonhomogeneous equation. Show that superposition principle is valid only in case of linear homogeneous equation. (12)
- (b) What are beats? Distinguish between phase velocity and group velocity of a train of waves and establish a relationship between them. (13)
- (c) Two SHM's acting simultaneously on a particle are given by $y_1 = 2 \sin \omega t$; (10)
 $y_2 = \sin(\omega t + \frac{\pi}{3})$; Find the equation of the resultant vibrations.
6. (a) What is meant by interference of sound waves? Derive the differential equation of a damped harmonic oscillator. What is logarithmic decrement of a damped oscillatory motion? (15)
- (b) What do you mean by resonance and quality factor of an oscillator? (10)
- (c) An under damped harmonic oscillator has its amplitude reduced $\frac{1}{20}$ th of its initial value after 200 oscillations. Its time period is 1.30 sec. (10)
- (i) Calculate the damping constant and relaxation time.
- (ii) If the observed value of the first amplitude of the oscillator were 2.2 cm, what would be its value in the absence of damping?
7. (a) Show that the energy of a plane progressive wave is given by (13)
 $E = 2\pi^2 \delta V^2 a^2$; where the symbols have their usual meanings.
- (b) Show that in the case of stationary wave no energy is transferred. (12)
- (c) A car sounding a horn producing a note of 400 Hz approaching and then passing a stationary observer at a steady speed of 30 ms^{-1} . What will be the frequency apparent to the observer when the car is (i) Approaching (ii) Receding? What is the interval between two notes? (velocity of sound = 340 ms^{-1}) (10)
8. (a) What is loudness? Discuss different factors on which loudness depends. (10)
- (b) Derive an analytical expression for the growth and decay of sound intensity inside an auditorium and hence obtain Sabine's reverberation formula. (15)
- (c) A room has dimensions $4 \times 6 \times 8$ meters. Calculate (i) the mean free path of the sound wave in the room, (ii) the number of reflections made per second by the sound wave with the walls of the room. Velocity of the sound in air is 350 m/s. (10)
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Khulna University of Engineering & Technology
Department of Building Engineering and Construction Management
B. Sc. Engineering 1st Year 1st Term Regular Examination, 2017
HUM 1123
(English)

Full Marks: 210

Time: 3 hrs

- N.B.** i) Answer any three questions from each section in separate script.
ii) Figures in the right margin indicate full marks.

Section – A

1. (a) Frame the questions from the underlined parts of the following answers: (14)
- (i) The shop at the corner is mine.
 - (ii) We know what he will say.
 - (iii) The train leaves the station at 10 am.
 - (iv) He drives 60 miles per hour.
 - (v) The next parliament election will be held in 2019.
 - (vi) I am very glad to meet you.
 - (vii) I am going to Khulna.
- (b) Make sentences using the following words as directed: (12)
- Right (as noun), But (as adverb), Back (as verb), Back (as adverb), Chair (as verb),
Chair (as adjective)
- (c) Change the following words as directed and make sentences with the changed words: (09)
- Mouth (into adjective), Clear (into noun), Capital (into verb), Behaviour (into verb),
Behaviour (into adjective), White (into verb).
2. (a) Make a word with each of the following prefixes and suffixes and use them in sentences: (14)
- A....., De....., Pro....., Se.....,ance,ish,ster.
- (b) Correct the following sentences: (12)
- (i) He has been profited by the experience.
 - (ii) One should do his duty.
 - (iii) I get up early in morning.
 - (iv) I wish you will help me.
 - (v) Do you know who am I?
 - (vi) The stone is very hard to be broken.
- (c) Make sentences using the following phrases and idioms: (09)
- White lies, Tall talk, A slow coach, Jaundiced eye, Eat crow, Fresh blood.

3. (a) Make sentence with the following structures using the words given in brackets: (14)
- (i) Subj. + Intransitive Verb + Adv. of manner. (write as verb)
 - (ii) Why + Subj. + Verb + Adv. of manner + Verb + Adj. complement. (come and is as verb)
 - (iii) Subj. + that + Verb + Adv. of place + Verb + Object. (is and shock as verb)
 - (iv) Since + Subj. + Verb + Adv. of manner, Subj. + Verb + Adv. of place. (work and succeed as verb)
 - (v) Not only + Subj. + but also + Subj. + Verb + Adv. of place. (Attend as verb)
 - (vi) Subj. + Verb + Object + as + Subj. + Verb + Object. (complete and suggest as verb)
 - (vii) Subj. + Verb + So + Adj. complement + that + Subj. + Verb + Adv. of place. (is and shine as verb)
- (b) Make sentences using the following Modals as directed: (12)
- (i) Could (To express inference)
 - (ii) Should (To express duty in the past)
 - (iii) Need (To express unnecessary action in the present)
 - (iv) Be to (To express command)
 - (v) Be going to (To express strong possibility)
 - (vi) May (To express guess about the present)
- (c) Identify the parts of speech of the underlined words of the following sentences: (09)
- (i) He led me wrong.
 - (ii) He is a man of no worth.
 - (iii) What is your name?
 - (iv) What book do you like best?
 - (v) What! Can this be true?
 - (vi) The then Govt. approved the project.
4. (a) Transform the following sentences as directed. (14)
- (i) I know that he is honest. (Simple)
 - (ii) Tell me your findings. (Complex)
 - (iii) What is lotted cannot be blotted. (Active)
 - (iv) The ship rested unmoving. (Negative)
 - (v) The man shot the bird. (Interrogative)
 - (vi) They were hungrier than I thought. (Positive)
 - (vii) Father wants me to be an engineer. (Compound)
- (b) Make one synonym and one antonym of each of the following words and make sentences with new words. (12)
- Advance; Bondage; Commence; Disciple.
- (c) Supply a suitable word to fill the blanks. (09)
- (i) He is busy..... to his friend.
 - (ii) He reached the stations on.....
 - (iii) What..... you doing now?
 - (iv) It is timethem to start.
 - (v) He will go abroad..... a piece of business.
 - (vi) He prides.....on his success.

Section – B

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

We should seek timely precautions against all dangers. If a defect is left unattended for some time, it becomes difficult to remove it. It, so stresses the need of doing our work in time. A small hole in a garment, if not stitched in time, may develop in a big hole and require nine stitches later on. It might also result in the total loss of the garment. So in care of our body it may have our bad effect if we don't take an action for a smooth healthy way of life, it may come a situation where we will have no possible ways to lead it in a healthy way. We then will undergo a great loss; even cure can't work in our body. It may become incurable. It is, therefore, better to have preventive measures in the beginning than to have curative measures later on. At all levels of human beings' life it should be taken preventive measures, because, it shows the necessity of ripping the evil in the bud. A rebellion must be put down almost at once; otherwise it might overthrow even a mighty emperor. For taking action before we suffer we need to use our intellectuality, our strong will, our hard-working, punctuality, strict principle, etc. There may play as safeguard to take action before dangers come. Otherwise we will be afflicted as in care of garment, in curable disease, etc. A person, who fails toward the future dangers in time, always suffers. History is full of such examples. Humayun lacked this quality of acting at the right moment. He lost his empire and had to remain in exile for 15 years. So we should take actions in care of environment, economy, health, educations for a proper development before they undergo a severe damage in future.

Questions:

- (i) Why should we take a timely action?
(ii) What happens to a garment and why does it happen to it?
(iii) Why should we take timely action?
(iv) In order to take timely action what do we do?
- (b) Make a précis of the above written passage (Q.5. a) with a suitable title. (15)
6. (a) Write a listing paragraph on liberty. (Around 1000 words) (20)
(b) Make a report on the catching fire of your area. (Around 800 words) (15)
7. (a) Write a letter to your sister on the role of women in a nation-building. (Around 1000 words) (20)
(b) Amplify the idea - liberty without bread is meaningless. (Around 800 words) (15)
8. Write a free composition on one of the followings. (Around 1800 words) (35)
(a) How can I serve my country.
(b) The role of intellectuals in a nation-building.
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