

# **POLICY GUIDELINES FOR MATHEMATICS PAPER**

## **Paper Pattern and Distribution of Marks**

### **Mathematics HSSC-I**

The question paper is organized into following three sections, namely: "Section A, B & C": Questions posed may be text based or derived/unseen but in similar pretext and difficulty level as per the lessons taught in the course. Distribution of the questions with respect to cognitive domain within each section shall roughly be around 30 percent Knowledge (K), 50 percent Understanding (U) and 20 percent Application (A).

The Questions in these subjects should be designed in such a manner that no pet-definitions are asked or required from the candidates to be reproduced. Moreover the questions should be appropriately designed whilst keeping in consideration the time for thought-process (particularly in U and A Cognitive Domain questions) and the length of the subsequent text to be produced by the candidates.

### **SECTION — A**

This section consists of question number one with 20 compulsory structured part questions - Multiple Choice Questions (MCQs) of one mark each. These MCQs should preferably be designed in such a way that they cover the whole course taught. These MCQs should objectively test the understanding of the concepts of the candidates in these subjects.

### **SECTION — B**

This section consists of question number two (02) with preferably 16 part questions – Short Response Questions (SRQs) of four (04) marks each. The candidates are required to attempt (respond to) any Twelve (12) SRQs for a maximum total of 48 marks in this section.

### **SECTION — C**

This section consists of Six (06) Extended Response Question (ERQs) of 8 marks each. Candidates are required to attempt (respond to) any Four (04) of these ERQs as per their choice and convenience for a maximum of 32 marks. These questions may comprise of two or more part questions each if deemed necessary by paper setter in order to balance out the distribution various concepts and knowledge areas from different Cognitive Domains taught in course.

## **Annexure for Policy Guidelines for Paper Setting**

### Definitions and Disclaimer

Policy guidelines for paper setting vide Notification No.6-8/FBISE/RES/CC/918 dated 27 August 2019 have been conveyed for general information. Definitions of some terminologies and disclaimers are given in this annexure.

#### **1. Definitions**

##### **I. Cognitive Domains**

Cognitive domain refers to development of mental skill and acquisition of knowledge.

In the questions papers developed by Federal Board of Intermediate & Secondary Education, Islamabad from hereon will be intended to test the following cognitive domains of the candidates:

- Knowledge: Approximately 30% Question in each section
- Understanding: Approximately 50% Question in each section
- Application: Approximately 20% Question in each section

##### **i. Knowledge (K)**

Knowledge refers to the ability of the candidates to recall the learned or memorized information or data.

###### **Examples**

- A child reciting the alphabets of English
- Memorization and reproducing the dates and other facts etc.  
e.g. Pakistan came into being on 27th Night of Ramadan-ul-Mubarak.

###### **Related Verbs (Command Words)**

Arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, state etc.

##### **ii. Understanding (U)**

Understand (also called Comprehension) refers to ability of the candidates to comprehend (a set of) information and/or situation and provide his/her response to it accordingly.

###### **Examples**

- Performing analyses and illustrating the observations
- Comprehending the concepts of Social, Natural and Physical Sciences  
e.g. Discuss different types of noise and their impact on human health briefly.

###### **Related Verbs (Command Words)**

Classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate, rephrase, differentiate, compare etc.

##### **iii. Application (A)**

Application refers to the ability to use learned material in new and concrete situation to solve problems and/or to design a schedule or task.

###### **Examples**

- Performing analyses and illustrating the observations
- Comprehending the concepts of Social, Natural and Physical Sciences  
e.g. Illustrate the similes and metaphors given in the poem Daffodils.

### **Related Verbs (Command Words)**

Apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write etc.

## **II. Sections of Paper**

There are three or four (03 or 04) sections in each question paper:

### **i. Section-A**

Contains Multiple Choice Questions (MCQs). All questions are compulsory without any external or internal choice. Usually comprises of 20% of total marks of the (theory if applicable) paper.

### **ii. Section B**

Contains Short Response Questions (SRQ). Candidates may have external choice up to 33%. In addition to that internal choice may also be offered based upon model, content and/or nature of the subject.

- This section may contain approximately 50% of total marks in some of subjects of the (theory if applicable) paper.

### **iii. Section C**

This section usually contains Extended Response Questions (ERQ). Candidates may have external choice in the questions. In addition to that internal choice may also be offered based upon model, content and/or nature of the subject. For ERQs it may contain approximately 30% of total marks in some subjects of the (theory if applicable) paper.

## **III. Choice**

Sometimes the candidates are required to attempt a certain number of questions from a given pool or group of questions, it is commonly known as choice in questions.

There are two types of choices

### **i. External Choice**

Whenever the candidates are required to solve (respond to) a certain number of questions from a given pool it is called external choice. This choice may be around 33% in a section.

- e.g.
1. Answer any six parts in about 30-40 words each.  
(Out of eight questions)
  2. Attempt any eight questions from the following.  
(Out of eleven questions)

### **ii. Internal Choice**

Whenever the candidates have to solve (respond to) a question mandatorily but they have an option within the question it is called internal choice.

## **2. Disclaimers**

- I.** The cognitive levels and categories written in sample model paper are for explanation purpose only. In the actual question papers administered during examination shall not contain description of these cognitive domains.
- II.** Association of the cognitive domains is solely based on subject expert's judgment and may be subject to errors and/or omissions.
- III.** In the class rooms and during teaching the candidates (students) need to be taught about the time management in accordance with allocation of marks to the questions.







Federal Board HSSC-I Examination  
Mathematics Model Question Paper

Time allowed: 2.35 hours

Total Marks: 80

Note: Sections 'B' and 'C' comprise pages 1-2 and questions therein are to be answered on the separately provided Answer Book. Use supplementary answer sheet i.e., sheet B if required. Write your answers neatly and legibly.

**SECTION – B (Marks 48)**

Q.2 Attempt any TWELVE parts. All parts carry equal marks. (12 × 4 = 48)

- i. If  $Z_1 = 2 + i$ ,  $Z_2 = 3 + 2i$ ,  $Z_3 = 1 + 3i$  then express  $\frac{\overline{Z_1 Z_3}}{Z_2}$  in the form  $a + ib$ .
- ii. Convert the following to logical form and prove it by constructing truth table:  
 $(A \cap B)' = A' \cup B'$
- iii. Without expansion verify that  $\begin{vmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{vmatrix} = 0$ .
- iv. Find the real roots of  $\frac{18}{x^4} + \frac{1}{x^2} = 4$ .
- v. Resolve  $\frac{x^2+1}{x^3-1}$  into Partial Fractions.
- vi. Solve the system of equations  
 $2x^2 = 6 + 3y^2$  ;  $3x^2 - 5y^2 = 7$
- vii. The sum of first thirty terms of an A.P. is equal to square of sum of first six terms of the same A.P., then show that  $10a + 145d = 12a^2 + 60ad + 75d^2$ .
- viii. A die is rolled twice. Event  $E_1$  is the appearance of even number of dots and Event  $E_2$  is the appearance of more than 4 dots.  
Prove that  $P(E_1 \cap E_2) = P(E_1) \cdot P(E_2)$
- ix. Find the numbers greater than 23000 that can be formed from digits 1, 2, 3, 5, 6 without repeating any digit.
- x. Find the first four terms, in ascending powers of  $x$ , in the binominal expansion of  $\frac{1}{\sqrt{9+x}}$ .
- xi. Find correct to nearest centimeter distance at which a coin of diameter 1cm should be held so as to conceal the full moon whose diameter subtends an angle  $31'$  at the eye of observer on the earth.
- xii. If  $\alpha, \beta, \gamma$  are the angles of a triangle ABC, show that  
 $\cot \frac{\alpha}{2} + \cot \frac{\beta}{2} + \cot \frac{\gamma}{2} = \cot \frac{\alpha}{2} \cot \frac{\beta}{2} \cot \frac{\gamma}{2}$
- xiii. Draw the graph of  $y = \sec 2x$ ,  $x \in [0, \pi]$
- xiv. Prove that  $r_1 r_2 + r_2 r_3 + r_3 r_1 = s^2$

- xv. Prove that  $\tan^{-1} \frac{120}{119} = 2\cos^{-1} \frac{12}{13}$ .
- xvi. Show that  $2 \tan^2 \theta \cos \theta = 3$  can be written in the form  $2\cos^2 \theta + 3\cos \theta - 2 = 0$ .  
Hence solve the equation  $2 \tan^2 \theta \cos \theta = 3$  for  $0 \leq \theta \leq 2\pi$ .

### SECTION – C (Marks 32)

**Note:** Attempt any **FOUR** questions. All questions carry equal marks. (4 × 8 = 32)

- Q.3 Solve the system of equation by reducing its augmented matrix to the reduced echelon form:

$$\begin{aligned} x + 3y + 2z &= 3 \\ 4x + 5y - 3z &= -3 \\ 3x + 2y - 17z &= 42 \end{aligned}$$

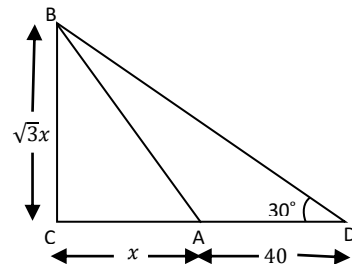
- Q.4 If 16 is divided into two parts such that sum of their squares is greater than twice of their product by 16.  
(a) Use the given conditions to show that  $x^2 - 16x + 60 = 0$   
(b) Find the two parts of 16 by solving equation  $x^2 - 16x + 60 = 0$ .

- Q.5 The sum of an infinite geometric series is half the sum of the squares of its terms. If the sum of its first two terms is  $\frac{9}{2}$ , find the series.

- Q.6 If  $2y = \frac{1}{2^2} + \frac{1 \cdot 3}{2!} \cdot \frac{1}{2^4} + \frac{1 \cdot 3 \cdot 5}{3!} \cdot \frac{1}{2^6} + \dots$ , then prove that  $4y^2 + 4y - 1 = 0$

- Q.7 Find the values of  $\sin \theta$  and  $\cos \theta$  without using calculator; when  $\theta = 18^\circ$ .

- Q.8 From the given figure a man at point A observes a building of height BC. Then he retreats 40m to reach at point D.  
(a) Find the angle of elevation of building at point A.  
(b) Find the height of the building BC.  
(c) Find the distance of point A from the building.



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