

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

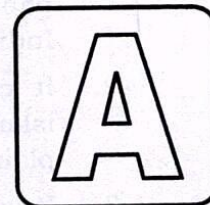
Test Booklet No. :

Series

06281

TEST BOOKLET

GENERAL STUDIES



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. Consider the following statements about Dibru-Saikhowa National Park in Assam :

1. It hosts one of the largest populations of feral horses in India.
2. It contains extensive riverine islands and alluvial flood plains.
3. It is a high-altitude ecosystem supporting grizzly bears.
4. It features mangrove forests similar to the Sundarbans.

Select the correct statement/statements using the codes given below.

- (A) 1 and 2 are correct
- (B) 3 and 4 are correct
- (C) 1 and 3 are correct
- (D) Only 1 is correct

2. Zubeen Garg was honoured with the National Film Award for Best Music Direction (Non-Feature Film) for his work on which one of the following?

- (A) Ya Ali
- (B) Echoes of Silence
- (C) Jajabor
- (D) Anuradha

3. The Food Safety and Standards Authority of India (FSSAI) operates under which one of the following?

- (A) The Ministry of Health and Family Welfare
- (B) The Ministry of Consumer Affairs, Food and Public Distribution
- (C) The Ministry of Agriculture and Farmers Welfare
- (D) NITI Aayog

4. The BRICS group of nations, which consists of emerging economies, was originally formed to promote cooperation in which of the following areas?

- (A) Military alliances and defence strategies
- (B) Economic growth, trade and development among member nations
- (C) Cultural exchange and tourism promotion
- (D) Climate change and disaster management

5. The primary objective of the Atmanirbhar Bharat (Self-Reliant India) package announced in 2020 was to

1. achieve food security for all its citizens
2. make India a global manufacturing hub
3. foster economic growth through self-sufficiency
4. increase India's export to US dollar 1 trillion by the year 2030

Select the correct answer using the codes given below.

- (A) 1 and 2 are correct
- (B) 3 and 4 are correct
- (C) 2 and 3 are correct
- (D) 1 and 4 are correct

6. The Assam Olympic Association (AOA) in 2025 launched the Bhogeswar Baruah National Sports Award in honour of athletic legend Bhogeswar Baruah. Which of the following is **not** one of the categories in which the Award is conferred?

- (A) Best Sports Person (National)
- (B) Emerging Player (Assam)
- (C) Lifetime Achievement (Assam)
- (D) Best Coach (National)

7. India's commitment to achieve Net Zero Emissions by 2070 relies heavily on which of the following economic transitions?

1. Expansion of the Green Hydrogen Mission
2. Phasing down of coal-based power generation
3. Increasing the share of electric vehicles in total transport
4. Dependence on imported rare earth minerals for clean technology

Select the correct answer using the codes given below.

- (A) 1 and 2 are correct
(B) 1, 2 and 3 are correct
(C) 2, 3 and 4 are correct
(D) All are correct

8. Who among the following was awarded the Nobel Peace Prize for the year 2025?

- (A) Guillermo del Toro
(B) Susumu Kitagawa
(C) Giorgia Meloni
(D) Maria Corina Machado

9. Consider the following statements regarding Maharaja Prithu, the 13th century King of Kamarupa :

1. He belonged to the Khen Dynasty.
2. He belonged to the Asura Dynasty.
3. He defeated Mir Jumla in battle.
4. He defeated Bakhtiyar Khilji in battle.

Select the correct statements using the codes given below.

- (A) 1 and 3 are correct
(B) 2 and 4 are correct
(C) 1 and 4 are correct
(D) 2 and 3 are correct

10. Which one of the following is the first industrial sector to come under the purview of the 'Global Carbon Tax'?

- (A) Iron and steel industry
(B) Shipping industry
(C) Thermal power project
(D) Automobile industry

11. The Enforcement Directorate (ED) is empowered to investigate offences under which of the following Acts?

1. The Prevention of Money Laundering Act (PMLA)
2. The Foreign Exchange Management Act (FEMA)
3. The Narcotic Drugs and Psychotropic Substances Act (NDPS Act)
4. The Fugitive Economic Offenders Act (FEOA)

Select the correct answer using the codes given below.

- (A) 1 and 2 are correct
(B) 1, 2 and 3 are correct
(C) 1, 2 and 4 are correct
(D) All are correct

12. Consider the following statements regarding the city of Sri Vijaya Puram :

1. This city once served as a naval base of the Chola Empire.
2. The old name of this city was Tirunelveli.
3. It was in this city where Netaji Subhas Chandra Bose unfurled the Indian Tiranga for the first time.
4. The Cellular Jail during the British Raj was situated here.

Select the correct statements using the codes given below.

- (A) 1 and 2 are correct
(B) 2 and 3 are correct
(C) 1, 3 and 4 are correct
(D) 2, 3 and 4 are correct

13. The Government of Assam instituted the 'Shraddhanjali Scheme' in 2025 to

- (A) grant financial assistance to Vaishnavite Satras in Assam
- (B) facilitate transportation of bodies of persons from Assam who die unexpectedly outside the State
- (C) grant one-time financial aid to the next of kin of cultural icons who died after the year 2014
- (D) establish special educational institutions for the visually impaired persons of the State

14. The SHANTI Act, 2025 of the Government of India

- (A) permits private sector participation in nuclear power generation in the country
- (B) permits foreign technical and financial involvement in the exploration of rare earth metals in Jammu and Kashmir
- (C) permits ONGC to undertake oil and natural gas exploration in the States of Mizoram and Manipur
- (D) permits private sector participation in the afforestation of Rann of Kutch

15. Dr. B. R. Ambedkar's association with Independent Labour Party, founded in the year 1936, primarily focused on

- (A) demanding a separate electorate for Dalits
- (B) advocating rights of both workers and peasants, regardless of castes

(C) organized nationwide Satyagraha for temple entry of Dalits

(D) representing India in the Round Table Conference

16. In the context of India's Freedom Struggle, the term 'Dandi March' is associated with

- (A) boycott of foreign goods
- (B) breaking the Salt Law
- (C) demand for Purna Swaraj
- (D) protest against the Rowlatt Act

17. Which Ahom King built the historic Dhodar Ali in Assam?

- (A) Rudra Singha
- (B) Pratap Singha
- (C) Gadadhar Singha
- (D) Siva Singha

18. In which Session of the Indian National Congress was the National Song 'Vande Mataram' sung?

- (A) 1885 at Bombay
- (B) 1920 at Nagpur
- (C) 1917 at Calcutta
- (D) 1896 at Calcutta

19. With reference to the Cabinet Mission, consider the following statements :

1. The Cabinet Mission reached India in the year 1946.
2. The Cabinet Mission did not hold any conference with representatives of the Muslim League and the Congress.
3. The Cabinet Mission proposed a three-tiered system for the Constitution of India.

Which of the statements given above is/are correct?

- (A) Only 1 is correct
- (B) 1 and 3 are correct
- (C) Only 3 is correct
- (D) 2 and 3 are correct

20. The best example of the ruins of Vijayanagara Empire can be seen in
 (A) Vatapi
 (B) Halebid
 (C) Hampi
 (D) Bijapur
21. Rabindranath Tagore gave up his 'Knighthood' because of
 (A) brutal suppression by the British of the Civil Disobedience Movement
 (B) Jallianwala Bagh massacre
 (C) Bhagat Singh's execution
 (D) Chauri Chaura incident
22. Which of the following is **not** true in the context of the Prarthana Samaj?
 (A) It was a dissident group of the Arya Samaj.
 (B) It was a reform movement within Hinduism.
 (C) It was founded by Atmaram Pandurang.
 (D) It mainly concentrated on social reforms.
23. Who among the following freedom fighters of Assam is known for leading the Quit India Movement in Gohpur and for her martyrdom while trying to hoist the Indian National Flag at the police station?
 (A) Chandrabhabha Saikiani
 (B) Kanaklata Barua
 (C) Punyaprabha Barua
 (D) Pushpalata Das
24. The *Jatakas* are a collection of stories associated with
 (A) the life of Mahavira and his teachings
 (B) the previous births of Gautama Buddha
 (C) the exploits of kings of ancient India
 (D) the philosophical debates in the Upanishads
25. Srimanta Sankardev's Borgeets are significant in Assamese literary history because
 (A) they were written in Sanskrit and was inaccessible to the common people
 (B) they created a new lyrical form blending spiritual devotion and classical literary techniques
 (C) they are exclusively oral and never written down
 (D) of the extensive use of Tai and Austric languages over Assamese
26. The 'Hastividya-nava Paintings' are a magnificent creative work of
 (A) Dilbar and Dosai
 (B) Ruchi Bapu and Purnakam
 (C) Durgaram Betha
 (D) Ghanashyam Khargharia
 Phukan
27. Which State of India has the maximum mangrove vegetation cover?
 (A) West Bengal
 (B) Gujarat
 (C) Tamil Nadu
 (D) Kerala
28. Consider the following statements regarding the Union Territories of India :
 1. There are eight Union Territories in India.
 2. All Union Territories have Legislative Assemblies.
 3. One Union Territory has a High Court.
 4. One Union Territory is the capital of two States.
 Select the correct statements using the codes given below.
 (A) 1 and 2 are correct
 (B) 2 and 3 are correct
 (C) 1 and 4 are correct
 (D) 1, 3 and 4 are correct

29. Which of the following regions in India have coral reef ?

1. Andaman and Nicobar Islands
2. Gulf of Kutch
3. Gulf of Mannar
4. Sundarbans

Select the correct answer using the codes given below.

- (A) 1, 2 and 3 are correct
- (B) 2 and 4 are correct
- (C) 1 and 3 are correct
- (D) All are correct

30. Consider the statement, "From a geological perspective, the Indian subcontinent was part of Gondwanaland." The geological factor that helps justify the statement is the presence of

- (A) young folded mountains like the Himalayas
- (B) widespread deposits of coal and certain dinosaur fossils
- (C) deep canyon systems like the Gandikota Canyon
- (D) active volcanic regions in the Deccan Plateau

31. Which one of the following planets has the largest number of natural satellites or moons?

- (A) Jupiter
- (B) Mars
- (C) Saturn
- (D) Venus

32. List-I gives the names of reservoirs and List-II gives the States in which they are situated. Match List-I and List-II and select the one which is correct :

List-I (Reservoirs)	List-II (States)
(A) Ghataprabha	Telangana
(B) Gandhi Sagar	Madhya Pradesh
(C) Indira Sagar	Andhra Pradesh
(D) Maphou	Chhattisgarh

33. Over which river of Assam is the Tipaimukh Dam constructed?

- (A) Kopili
- (B) Dihing
- (C) Jia Bharali
- (D) Barak

34. In which one of the following States of North-East India, flowering of bamboo usually results in the onset of famine, a phenomenon locally termed as 'Mautam'?

- (A) Meghalaya
- (B) Mizoram
- (C) Arunachal Pradesh
- (D) Sikkim

35. With reference to India, consider the following sites. Which of them are Ramsar Sites?

1. Loktak Lake
2. Son Beel
3. Deepor Beel
4. Chilika Lake

Select the correct answer using the codes given below.

- (A) 1 and 2 are correct
- (B) 2 and 3 are correct
- (C) 2, 3 and 4 are correct
- (D) 1, 3 and 4 are correct

36. The South-Eastern Coast of India is called
- Konkan Coast
 - Coromandel Coast
 - Malabar Coast
 - Mannar Coast
37. Which State of India has a rich deposit of the radioactive mineral containing thorium?
- Madhya Pradesh
 - Kerala
 - Rajasthan
 - Mizoram
38. The leading producer of gold in India is the State of
- Andhra Pradesh
 - Madhya Pradesh
 - Karnataka
 - Arunachal Pradesh
39. Which of the following is a joint venture of the Reserve Bank of India and the Government of India to provide digital payment infrastructure?
- The Securities and Exchange Board of India (SEBI)
 - The National Payments Corporation of India (NPCI)
 - The Small Industries Development Bank of India (SIDBI)
 - The National Bank for Agriculture and Rural Development (NABARD)
40. The core principle of Keynesian economics is that during a severe economic recession, the government should
- reduce its spending to balance the budget and restore investor confidence
 - increase spending, even if it means running a fiscal deficit, to boost aggregate demand
 - focus primarily on controlling the money supply through the central bank
 - lower taxes for corporations to stimulate investments, regardless of the deficit
41. Which sector received special focus in the Second Five-Year Plan (1956–1961) of India?
- Agriculture
 - Heavy industries
 - Education
 - Health
42. The POSHAN Abhiyaan, launched in India in the year 2018, focuses on
- promoting traditional Indian cuisines
 - combating malnutrition among children and women
 - regulating animal fats in food products
 - providing free health insurance to senior citizens
43. The 'Blue Revolution' in India is primarily associated with
- milk production and dairy development
 - fisheries and aquaculture
 - space exploration and satellite technology
 - water conservation and harvesting

44. The Finance Commission of India is a constitutional body primarily tasked with

- (A) preparing the Union Budget
- (B) recommending tax sharing between the Centre and the States
- (C) controlling inflation and money supply
- (D) auditing government accounts

45. Which of the following are considered as financial instruments?

- 1. Exchange-traded funds
- 2. Certificates of deposit
- 3. Motor vehicles
- 4. Mutual funds

Select the correct answer using the codes given below.

- (A) 1 and 3 are correct
- (B) 2 and 4 are correct
- (C) 2, 3 and 4 are correct
- (D) 1, 2 and 4 are correct

46. The Economic Survey of India is officially prepared and published every year by the

- (A) Reserve Bank of India
- (B) Planning Commission of India
- (C) Ministry of Finance
- (D) Ministry of Commerce and Industry

47. During the Independence Movement, the newspaper *Kesari* was founded by

- (A) Subhas Chandra Bose
- (B) Bal Gangadhar Tilak
- (C) Muhammad Ali Jinnah
- (D) Lala Lajpat Rai

48. Which of the following statements is/are correct regarding land revenue administration of the East India Company?

- 1. The Permanent Settlement was made with the Zamindars.
- 2. The Mahalwari Settlement was made with the moneylenders.
- 3. The Ryotwari Settlement was made with the peasants.

Select the correct answer using the codes given below.

- (A) Only 1 is correct
- (B) 2 and 3 are correct
- (C) 1 and 3 are correct
- (D) All are correct

49. The Doctrine of Lapse, which became a major cause of resentment against the British East India Company, was a policy most aggressively implemented by

- (A) Lord Dalhousie
- (B) Lord Wellesley
- (C) Lord Cornwallis
- (D) Warren Hastings

50. The Montagu-Chelmsford enacted the Government of India Act, 1919 which introduced significant changes. The proposals were related to

- (A) social reforms
- (B) educational reforms
- (C) reforms in public administration
- (D) constitutional reforms

51. The 'Poona Pact' of 1932 was an agreement between Mahatma Gandhi and B. R. Ambedkar concerning

- (A) the launch of the Non-Cooperation Movement
- (B) the rights and political representation of the depressed classes (Scheduled Castes)
- (C) the merger of Princely States to the Indian Union
- (D) the strategy for the Quit India Movement

52. What will be the 20th term in the series 10, 15, 20, 25, ...?

- (A) 110
- (B) 125
- (C) 105
- (D) 140

53. In a certain language, cow is called sheep, sheep is called elephant, elephant is called rat, rat is called giraffe, giraffe is called ant. Which one is the tallest animal according to the language?

- (A) Rat
- (B) Ant
- (C) Elephant
- (D) Giraffe

54. A, D, F, Q and T are sitting in a row. A is in the left of Q and to the right of D. F is to the right of Q. T is between Q and F. Who is in the middle of the row?

- (A) Q
- (B) A
- (C) D
- (D) T

55. Find the next term in the following series :

AZ, BY, CX, DW, ?

- (A) EV
- (B) EU
- (C) FU
- (D) ET

56. Consider two positions of a die. In the first position, the faces showing the numbers 2, 3 and 4 are adjacent to each other. In the second position, the faces showing the numbers 2, 5 and 1 are adjacent to each other. Which number is on the face opposite to the number 2?

- (A) 1
- (B) 3
- (C) 5
- (D) 6

57. Pointing to a man, Surekha said, "He is the brother of the mother of my father's son." How is the man related to Surekha?

- (A) Father
- (B) Brother
- (C) Maternal uncle
- (D) Cousin

58. If a person's shadow falls exactly to his North at noon, where is the sun located?

- (A) Directly to the East
- (B) Directly to the West
- (C) Directly overhead
- (D) Directly to the South

59. Which word will come first in an English dictionary from among the following words?

- (A) Minority
- (B) Minnows
- (C) Ministry
- (D) Minus

60. A lady borrowed ₹24,000 from two moneylenders. For one loan, she paid interest of 15% per annum and for the other, she paid interest of 18% per annum. At the end of one year, she paid a total of ₹4,050 as interest. How much did she borrow at each rate?

- (A) ₹15,000 at 15% and ₹9,000 at 18%
- (B) ₹9,000 at 15% and ₹10,000 at 18%
- (C) ₹9,000 at 15% and ₹18,000 at 18%
- (D) ₹9,000 at 15% and ₹15,000 at 18%

61. If the statement, "All students are intelligent" is true, which of the following statements is/are false?

- 1. No students are intelligent.
- 2. Some students are intelligent.
- 3. Some students are not intelligent.

Select the correct answer using the codes given below.

- (A) 1 and 2 (B) 1 and 3
- (C) 2 and 3 (D) Only 1

62. Mr. Anil, Miss Bibha, Mr. Chandra and Miss Dipali are sitting around a table and discussing their trade.

- 1. Mr. Anil sits opposite to the cook.
- 2. Miss Bibha sits to the right of the barber.
- 3. The washerman sits right of the barber.
- 4. Miss Dipali sits opposite to Mr. Chandra.

What are the trades of Mr. Anil and Miss Bibha?

- (A) Tailor and barber
- (B) Barber and cook
- (C) Tailor and cook
- (D) Tailor and washerman

63. The sides of a triangle are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{4}$ and its perimeter is 104 cm. The length of the largest side is

- (A) 52 cm
- (B) 48 cm
- (C) 32 cm
- (D) 26 cm

64. There are two statements P and Q followed by an inference drawn from these two statements. The two statements are as follows :

P : Water boils at 100°C . This liquid boils at 100°C . Therefore, this liquid is water.

Q : Every bottle with a blue label contains fruit juice. Fruit juice is safe to drink. Therefore, it is harmless to drink from every bottle with a blue label.

Inference :

Blue-labelled bottles are harmless. Therefore, one who drinks from it, is a good man.

Determine which of the statements P and Q supports/support the inference.

- (A) Only statement P supports the inference
- (B) Only statement Q supports the inference
- (C) Both P and Q support the inference
- (D) Neither of them supports the inference

65. Consider the following statements about 'Mission LiFE' :

1. Mission LiFE means lifestyle for environment.
2. India is the first country to include LiFE in its nationally determined contributions.
3. Mission LiFE is a collective action for protecting and conserving the environment in the period 2022-2028.

Which of the above statements is/are incorrect?

- (A) All are incorrect
- (B) Only 2 is incorrect
- (C) 1 and 3 are incorrect
- (D) None of them is incorrect

66. What is the type of memory circuitry that holds a computer's startup routine?

- (A) Read Initial Memory
- (B) Random Access Memory
- (C) Read Only Memory
- (D) Cache Memory

67. The phenomenon of 'bleaching of coral reef' is due to

- (A) dumping of plastics in the ocean
- (B) rise in temperature of the ocean due to climate change
- (C) depositing radioactive wastes on the ocean bed
- (D) accidental spilling of crude oil in the open seas

68. 'Falap' is the traditional tea of which one of the following communities of North-East India?

- (A) Singpho
- (B) Tai Phake
- (C) Deori
- (D) Mising

69. Who is known as the 'Missile Woman' of India?

- (A) Dr. Tessy Thomas
- (B) Dr. Ritu Karidhal
- (C) Dr. Muthayya Vanitha
- (D) Dr. Anuradha T. K.

70. Consider the following statements about 'DAKSH' :

1. DAKSH is an advanced supervisory monitoring system.
2. DAKSH is maintained by the Reserve Bank of India.

Which of the above statements is/are correct?

- (A) Only 1 is correct
- (B) Both 1 and 2 are correct
- (C) Only 2 is correct
- (D) Neither 1 nor 2 is correct

71. Which one of the following is a disease which cannot be prevented through vaccination?

- (A) Malaria
- (B) Typhoid
- (C) Elephantiasis
- (D) Anaemia

72. Which of the following classes of corvettes is primarily designed for anti-submarine warfare and forms a key part of India's indigenous naval capabilities?

- (A) Kora Class
- (B) Kamorta Class
- (C) Khukri Class
- (D) Shivalik Class

73. The Eaglenest Wildlife Sanctuary recently studied the altitudinal shifts in the migration of birds due to climate change. Which globally recognized biodiversity hot spot was the target of this study?

- (A) Eastern Himalayan hot spot
- (B) Himalayan biodiversity hot spot
- (C) Sundaland biodiversity region
- (D) Deccan Peninsula ecozone

74. In traditional Assamese cuisines, the dish 'Khar' is unique. It is prepared using which one of the following ingredients as its key component?

- (A) Fermented fish
- (B) Alkaline water filtered through sun-dried banana ash
- (C) Tamarind pulp and jaggery
- (D) Rice flour and mustard paste

75. The 'White Revolution' in India which made the country the largest producer of milk in the world is credited to

- (A) M. S. Swaminathan
- (B) Verghese Kurien
- (C) Har Gobind Khorana
- (D) A. P. J. Abdul Kalam

76. Which one of the following statements about impact of global warming is the most accurate?

- (A) Global warming only affects polar regions and has no effect on the tropical region.
- (B) Rising global temperature can lead to melting of glaciers, rise in sea level and extreme weather events.

(C) Increase in carbon dioxide levels benefits all plant species uniformly.

(D) Global warming has no effect on ocean currents or the marine ecosystems.

77. Rare earth magnets which include neodymium-iron-boron (NdFeB) are used in

- (A) high-performance automotive appliances
- (B) the construction of rails for high-speed trains
- (C) the construction of the body of the outermost part of a spacecraft
- (D) the construction of MRI machines for diagnosis

78. The concept of Welfare State is elaborated in which part of the Indian Constitution?

- (A) The Preamble to the Constitution
- (B) The Fundamental Rights
- (C) The Directive Principles of State Policy
- (D) The 8th Schedule of the Constitution

79. Which of the following statements is incorrect with reference to the Rajya Sabha?

- (A) The Rajya Sabha is a permanent body.
- (B) It can be dissolved after a lapse of six years.
- (C) The Rajya Sabha was duly constituted for the first time in April 1952.
- (D) It held its first session on 13th May, 1952.

80. Which of the following powers the President of India has in relation to the Lok Sabha?

1. Summoning
2. Adjournment sine die
3. Prorogation
4. Dissolution

Select the correct answer using the codes given below.

- (A) 1 and 4 are correct
- (B) 1, 2 and 3 are correct
- (C) 1, 3 and 4 are correct
- (D) All are correct

81. The Chief Minister of a State is not eligible to vote in the Presidential election if

- (A) he/she himself/herself is a candidate
- (B) he/she is a caretaker Chief Minister
- (C) he/she has a criminal case pending against him/her
- (D) he/she is a nominated member of the State Legislative Assembly

82. The purpose of the inclusion of the Directive Principles of State Policy in the Indian Constitution is to establish

- (A) political democracy
- (B) social democracy
- (C) Gandhian democracy
- (D) social and economic democracy

83. Who among the following is the custodian of the Constitution of India?

- (A) The President of India
- (B) The Prime Minister of India
- (C) The Lok Sabha Secretariat
- (D) The Supreme Court of India

84. India is regarded as a country with demographic dividend. This is due to

- (A) its high population in the age group below 15 years
- (B) its high population in the age group of 15-64 years
- (C) its high population in the age group above 65 years
- (D) its high total population

85. Which one of the following is responsible for the preparation of the Union Budget to the Parliament?

- (A) The Department of Revenue
- (B) The Department of Economic Affairs
- (C) The Department of Finance
- (D) The Department of Expenditure

86. Consider the following statements in relation to the 'Nijut Moina 2.0 Scheme':

1. This Scheme is a flagship initiative of the Government of Assam.
2. This Scheme provides monthly financial assistance to only Higher Secondary and Under Graduate students.
3. A student of Higher Secondary is entitled to receive ₹1,000 every month for a duration of 10 months.

Which of the above statements is/are correct?

- (A) 1 and 3 are correct
- (B) Only 2 is correct
- (C) Only 3 is correct
- (D) All are correct

87. What can be the reason/reasons for termination of Indian citizenship?

- (A) By voluntarily acquiring citizenship of any other country
- (B) By staying out of India continuously for seven years
- (C) By showing disloyalty towards the country
- (D) All of the above

88. Which Article of the Constitution provides safeguards to the Naga community and their social practices against any Act of the Parliament?

- (A) Article 371A
- (B) Article 371B
- (C) Article 371C
- (D) Article 263

89. The principle of 'Checks and Balances' in the Indian Constitution is best exemplified by the power of the

- (A) President to appoint the Chief Justice of India
- (B) Supreme Court to strike down a law passed by the Parliament
- (C) Speaker of the Lok Sabha to adjourn the House
- (D) Election Commission to recognize a political party

90. Who wrote the Assamese play *Ram Nabami* which is considered one of the first modern Assamese plays?

- (A) Lakshminath Bezbarua
- (B) Gunabhiram Barua
- (C) Hemchandra Barua
- (D) Bhattadev

91. Which of the following awards is presented annually in Assam to recognize outstanding contributions to the Assamese language or cultural heritage?

- (A) Lachit Award
- (B) Anundoram Borooah Award
- (C) Assam Baibhav Award
- (D) Srimanta Sankardev Award

92. The Barak Festival, held in Assam, is known for promoting which of the following?

- (A) Adventure sports, art and culture of North-East India
- (B) Traditional fishing and river sports of Assam
- (C) Tea tourism and plantation sports in Barak Valley
- (D) High-altitude trekking and mountaineering in Assam-Mizoram border mountains

93. Which of the following are correctly matched?

1. Porag Festival—Mising
2. Wangala Festival—Khasi
3. Jonbeel Mela—Tiwa
4. Behdienkhlam Festival—Jaintias

Select the correct answer using the codes given below.

- (A) 1 and 2 are correct
- (B) 1, 2 and 3 are correct
- (C) 1, 3 and 4 are correct
- (D) 1 and 3 are correct

94. The Raga which is sung in the early hours of morning is

- (A) Ahir Bhairav
- (B) Darbari
- (C) Bhopali
- (D) Bhimpalasi

95. With reference to the art and archaeological history of India, which one among the following was the earliest?

- (A) Lingaraja Temple at Bhubaneswar
- (B) Rock-cut elephant at Dhauli
- (C) Rock-cut monuments at Mahabalipuram
- (D) Varaha image at Udayagiri

96. The 'Barekuri' village in Tinsukia is famous for

- (A) golden langur
- (B) hoolock gibbon
- (C) swamp deer
- (D) hornbill

97. List-I gives the names of famous sports persons of Assam and List-II gives the names of sports associated with them. Match List-I and List-II, and select the correct answer using the codes given below :

<i>List-I</i>	<i>List-II</i>
a. Jayanta Talukdar	1. Swimming
b. Amlan Borgohain	2. Lawn Ball
c. Elvis Ali Hazarika	3. Archery
d. Nayanmoni Saikia	4. Athletics

Codes :

- (A) a b c d
 3 4 1 2
- (B) a b c d
 1 4 2 3
- (C) a b c d
 3 4 2 1
- (D) a b c d
 2 4 3 1

98. Purnima Devi Barman is renowned for the conservation of which one of the following?

- (A) Bengal florican
- (B) Greater adjutant stork
- (C) Golden langur
- (D) White-winged wood duck

99. Pushpa Bhuyan, who received Padma Shri in 2002, specialized in which of the following National Dance forms?

- (A) Odissi and Bharatanatyam
- (B) Bharatanatyam and Manipuri
- (C) Sattriya and Bharatanatyam
- (D) Odissi and Sattriya

100. 'Ghoomar' is the folk dance of which one of the following States?

- (A) Gujarat
- (B) Rajasthan
- (C) Maharashtra
- (D) Madhya Pradesh

SPACE FOR ROUGH WORK

SEAL

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

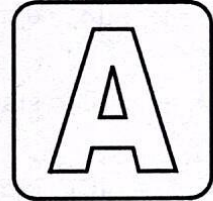
Test Booklet No. :

Series

04041

TEST BOOKLET

CIVIL ENGINEERING



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. The algebraic sum of moments of forces about any point is zero for a body in
 - (A) dynamic equilibrium
 - (B) static equilibrium
 - (C) kinetic equilibrium
 - (D) neutral equilibrium
2. The void ratio of a soil mass is defined as
 - (A) the ratio of volume of voids to total volume
 - (B) the ratio of volume of solids to volume of voids
 - (C) the ratio of volume of voids to volume of solids
 - (D) the ratio of water content to dry density
3. Venturi meter works on the principle of
 - (A) continuity equation
 - (B) momentum equation
 - (C) Bernoulli's theorem
 - (D) Pascal's law
4. Specific energy is minimum at
 - (A) normal depth
 - (B) maximum velocity
 - (C) critical depth
 - (D) uniform flow
5. Hydraulic jump is an example of
 - (A) gradually varied flow
 - (B) uniform flow
 - (C) rapidly varied flow
 - (D) laminar flow
6. Bernoulli's equation is based on the conservation of
 - (A) mass
 - (B) energy
 - (C) momentum
 - (D) angular momentum

7. The factor of safety of a slope is defined as
- (A) driving force/resisting force
 - (B) resisting force/driving force
 - (C) shear stress/shear strength
 - (D) normal stress/shear stress
8. In clayey soils, consolidation settlement occurs mainly due to
- (A) expulsion of air
 - (B) compression of solids
 - (C) expulsion of water
 - (D) chemical reaction
9. Coulomb's earth pressure theory considers
- (A) only wall friction
 - (B) only soil friction
 - (C) both wall friction and soil friction
 - (D) neither wall friction nor soil friction
10. The unit of coefficient of permeability is
- (A) m/s
 - (B) m^2/s
 - (C) kN/m^2
 - (D) It is dimensionless
11. The maximum dry density of soil is obtained at
- (A) zero air voids
 - (B) plastic limit
 - (C) optimum moisture content
 - (D) shrinkage limit
12. A material having identical properties in all directions is called
- (A) homogeneous
 - (B) isotropic
 - (C) elastic
 - (D) ductile
13. Hooke's law is valid up to
- (A) yield point
 - (B) elastic limit
 - (C) breaking point
 - (D) proportional limit only
14. Riveted joints are primarily subjected to
- (A) bending stress
 - (B) torsional stress
 - (C) shear stress
 - (D) bearing stress only

15. A simply supported beam of span 6 m carries a central point load of 12 kN. The maximum bending moment is

- (A) 12 kN-m
- (B) 18 kN-m
- (C) 24 kN-m
- (D) 36 kN-m

16. The angular velocity of a wheel rotating at 300 r.p.m. is

- (A) 10π rad/s
- (B) 20π rad/s
- (C) 5π rad/s
- (D) 30π rad/s

17. The momentum of a 5 kg body moving at 6 m/s is

- (A) 11 kg-m/s
- (B) 30 kg-m/s
- (C) 60 kg-m/s
- (D) 120 kg-m/s

18. The kinetic energy of a body of mass 4 kg moving at 5 m/s is

- (A) 25 J
- (B) 40 J
- (C) 50 J
- (D) 100 J

19. A flywheel has a mass moment of inertia of 10 kg-m^2 and angular velocity of 5 rad/s. The angular momentum is

- (A) $2 \text{ kg-m}^2/\text{s}$
- (B) $10 \text{ kg-m}^2/\text{s}$
- (C) $25 \text{ kg-m}^2/\text{s}$
- (D) $50 \text{ kg-m}^2/\text{s}$

20. A bar of cross-sectional area 500 mm^2 carries a tensile load of 50 kN. The stress developed is

- (A) 50 MPa
- (B) 100 MPa
- (C) 150 MPa
- (D) 200 MPa

21. If the Young's modulus is 200 GPa and strain is 0.001, then the stress developed is

- (A) 100 MPa
- (B) 150 MPa
- (C) 200 MPa
- (D) 250 MPa

22. The principal stresses are 80 MPa and 20 MPa. The maximum shear stress is

- (A) 20 MPa
- (B) 30 MPa
- (C) 40 MPa
- (D) 50 MPa

23. A beam fixed at one end and free at the other has length 2 m. The maximum deflection occurs at

- (A) mid-span
- (B) quarter-span
- (C) fixed end
- (D) free end

24. A simply supported beam of 8 m carries a point load at the centre. The location of maximum BM is at

- (A) support
- (B) mid-span
- (C) quarter-span
- (D) free end

25. Flow is laminar in pipes where the Reynolds' number is

- (A) 2000
- (B) 3000–4000
- (C) > 2000
- (D) > 6000

26. The centroid of a semicircular lamina of radius R is located at a distance _____ from the base.

- (A) $\frac{R}{2}$
- (B) $\frac{2R}{\pi}$
- (C) $\frac{4R}{3\pi}$
- (D) $\frac{3R}{4}$

27. The dimensional formula of force is

- (A) ML^2T^{-2}
- (B) MLT^{-1}
- (C) MLT^{-2}
- (D) $ML^{-1}T^{-2}$

28. A bar of 2 m length elongates by 1 mm under axial load. The longitudinal strain is

(A) 0.00025

(B) 0.0005

(C) 0.001

(D) 0.002

29. For rectilinear motion with constant acceleration, the velocity-time equation is

(A) parabolic

(B) hyperbolic

(C) straight line

(D) sinusoidal

30. Instantaneous centre of rotation is the point where

(A) acceleration is zero

(B) velocity is zero

(C) angular velocity is zero

(D) displacement is zero

31. The bending moment at a point, where the shear force is zero, is

(A) zero

(B) minimum

(C) maximum

(D) constant

32. The flexural formula is

(A) $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$

(B) $\sigma = E\varepsilon$

(C) $\tau = G\gamma$

(D) $M = EI$

33. The principle of virtual work is applicable when a system is

(A) in motion

(B) in static equilibrium

(C) in dynamic equilibrium

(D) under acceleration

34. A soil sample has void ratio of 0.6 and the specific gravity of solids is 2.65. The dry unit weight of the soil (take $\gamma_w = 9.81 \text{ kN/m}^3$) is

(A) 14.80 kN/m^3

(B) 15.60 kN/m^3

(C) 16.30 kN/m^3

(D) 17.20 kN/m^3

35. A soil sample has water content = 20% and dry density = 16 kN/m^3 . Determine the bulk density.

- (A) 18.0 kN/m^3
- (B) 19.20 kN/m^3
- (C) 20.0 kN/m^3
- (D) 21.60 kN/m^3

36. The coefficient of permeability of soil is $2 \times 10^{-4} \text{ m/s}$. If the hydraulic gradient is 0.5, then find the seepage velocity.

- (A) $1 \times 10^{-4} \text{ m/s}$
- (B) $2 \times 10^{-4} \text{ m/s}$
- (C) $4 \times 10^{-4} \text{ m/s}$
- (D) $1 \times 10^{-3} \text{ m/s}$

37. The factor of safety of a slope is 1.5. If the driving force = 100 kN, then the resisting force equals

- (A) 67 kN
- (B) 100 kN
- (C) 150 kN
- (D) 200 kN

38. The maximum shear stress theory is also known as

- (A) Rankine theory
- (B) Tresca theory
- (C) von Mises theory
- (D) Coulomb theory

39. The density of soil = 850 kg/m^3 . Find the pressure at 5 m depth.

- (A) 31.50 kPa
- (B) 41.70 kPa
- (C) 55.60 kPa
- (D) 83.40 kPa

40. Water flows in a pipe with velocity = 0.8 m/s, diameter = 0.2 m, kinematic viscosity = $1 \times 10^{-6} \text{ m}^2/\text{s}$. Determine the Reynolds' number.

- (A) 80000
- (B) 120000
- (C) 160000
- (D) 200000

41. The Froude number = 0.6 indicates that the flow is

- (A) supercritical
- (B) critical
- (C) subcritical
- (D) turbulent

42. Critical depth occurs when the specific energy is

- (A) maximum
- (B) zero
- (C) minimum
- (D) constant

43. For dynamically similar flows, the Reynolds' number must be

- (A) zero
- (B) constant
- (C) minimum
- (D) maximum

44. The venturi meter's coefficient of discharge is usually

- (A) < 0.5
- (B) $0.6-0.7$
- (C) $0.95-0.99$
- (D) > 1

45. Hydraulic jump causes loss of

- (A) mass
- (B) energy
- (C) momentum
- (D) discharge

46. A uniform ladder of length L and weight W rests against a smooth vertical wall and a rough horizontal floor (coefficient of friction = μ). The ladder makes an angle θ with the floor. Using the principle of virtual work, determine the minimum value of μ for equilibrium.

- (A) $\mu_{\min} = \frac{1}{2} \cos \theta$
- (B) $\mu_{\min} = \frac{1}{2} \cot \theta$
- (C) $\mu_{\min} = \frac{1}{2} \sin \theta$
- (D) $\mu_{\min} = \frac{1}{2} \operatorname{cosec} \theta$

47. Fixed beam has how many reactions?

- (A) 2
- (B) 3
- (C) 4
- (D) 6

48. The maximum shear force in simply supported beam with UDL occurs

- (A) at the centre
- (B) at the supports
- (C) at the quarter-span
- (D) anywhere

49. The observed bearings of lines AB and BC are given below :

Line	Fore Bearing	Back Bearing
AB	$45^{\circ}30'$	$225^{\circ}00'$
BC	$120^{\circ}15'$	$300^{\circ}45'$

Which station(s) is/are affected by local attraction?

- (A) A only
- (B) B only
- (C) B and C
- (D) None of the above

50. In a closed traverse, the total length = 600 m, error in latitude = $+ 0.24$ m, length of line AB = 150 m. The correction of latitude of AB is

- (A) -0.04 m
- (B) -0.06 m
- (C) -0.08 m
- (D) -0.10 m

51. A saturated clay sample has the following properties :

Specific gravity = 2.7

Void ratio = 0.8

The saturated unit weight (in kN/m^3) of the soil is closest to

- (A) 16.90
- (B) 18.40
- (C) 19.60
- (D) 21.20

52. A normally consolidated clay layer of thickness 4 m undergoes consolidation settlement of 48 mm. If the degree of consolidation is 25%, then the settlement at that time is

- (A) 6 mm
- (B) 12 mm
- (C) 18 mm
- (D) 24 mm

53. For a clay soil, the unconfined compressive strength is 120 kPa. The undrained shear strength (in kPa) is

- (A) 30
- (B) 40
- (C) 60
- (D) 120

54. The velocity of flow in a pipe increases from 2 m/s to 4 m/s. The increase in velocity head (in m) is

- (A) 0.31
- (B) 0.61
- (C) 1.22
- (D) 1.84

55. The dimensional formula of impulse is $[M]^a [L]^b [T]^c$. Find $a + b + c$.

- (A) 1
- (B) 2
- (C) 3
- (D) 4

56. Two cars A and B move in the same direction at 20 m/s and 12 m/s respectively. The relative velocity (in m/s) of A with respect to B is

- (A) 8
- (B) 4
- (C) 12
- (D) 20

57. Terzaghi's theory of consolidation is applicable for

- (A) two-dimensional flow
- (B) radial consolidation
- (C) one-dimensional consolidation
- (D) secondary compression

58. A solid cylinder of mass 10 kg and radius 0.2 m rotates about its axis. The moment of inertia (in kg-m^2) is

- (A) 0.2
- (B) 2
- (C) 10
- (D) 0.02

59. The discharge through a pipe is $0.04 \text{ m}^3/\text{s}$ and the diameter is 0.2 m. Find the velocity.

- (A) 0.8 m/s
- (B) 1.27 m/s
- (C) 2.0 m/s
- (D) 4.0 m/s

60. The head loss due to friction is directly proportional to

- (A) velocity
- (B) velocity²
- (C) diameter
- (D) pressure

61. A force of 10 N acts on a 2 kg mass. The acceleration produced is

- (A) 2 m/s^2
- (B) 4 m/s^2
- (C) 5 m/s^2
- (D) 10 m/s^2

62. If the Young's modulus $E = 200 \text{ GPa}$ and Poisson's ratio = 0.25, then the shear modulus G (in GPa) is

- (A) 100
- (B) 200
- (C) 80
- (D) 40

63. Two forces of 10 kN and 20 kN act at an angle of 60° between them. The magnitude of the resultant is

- (A) 26.50 kN
- (B) 30.00 kN
- (C) 17.30 kN
- (D) 15.00 kN

64. Sheet piles are commonly used to

- (A) increase bearing capacity
- (B) prevent seepage and soil movement
- (C) reduce settlement
- (D) improve compaction

65. The first stage of water treatment is

- (A) sedimentation
- (B) filtration
- (C) disinfection
- (D) coagulation and mixing

66. The pH value of drinking water should be in the range of

- (A) 1 to 10
- (B) 2 to 6
- (C) 6.5 to 8.5
- (D) 8.5 to 10

67. Tacheometry is best suited

- (A) where chaining is impossible
- (B) for populous area
- (C) in broken ground
- (D) for extremely accurate survey

68. During analysis for pure bending of beam, the beam is assumed to be subjected to

- (A) biaxial stress
- (B) uniaxial stress
- (C) compound stress
- (D) complementary shear stress

69. Thixotropy is a quality of soil

- (A) to regain compressive strength after vibration
- (B) to regain cohesion after kneading
- (C) to regain friction after kneading
- (D) to allow percolation

70. A Pitot tube is used to measure

- (A) velocity of flow
- (B) pressure of flow
- (C) rate of flow
- (D) total energy

71. If the principal stresses are 5 N/mm^2 (tension) and 3 N/mm^2 (compression), then the maximum shear stress is

- (A) 4 N/mm^2
- (B) 1 N/mm^2
- (C) 0 N/mm^2
- (D) None of the above

72. Geodetic surveying considers the earth's surface as

- (A) spheroidal
- (B) plane
- (C) straight
- (D) None of the above

73. The difference between undisturbed shear strength and remoulded shear strength is known as

- (A) activity
- (B) sensitivity
- (C) thixotropy
- (D) dilatancy

74. Under-reamed piles are generally

- (A) driven piles
- (B) bored cast in situ piles
- (C) precast piles
- (D) None of the above

75. If the age of loading on concrete structure is 28 days, then the creep coefficient may be taken as

- (A) 2.2
- (B) 2
- (C) 1.8
- (D) 1.6

76. In the primary treatment of sewage, the operation which takes place is

- (A) removal of settleable organic solids
- (B) removal of floating matter
- (C) removal of gravel
- (D) removal of oil and grease

77. The superelevation needed on a horizontal circular curve of 150 m radius for a design speed of 60 kmph with a coefficient of friction of 0.15 is
- (A) 1.26%
 - (B) 3.87%
 - (C) 5.25%
 - (D) 7.0%
78. The coefficient of discharge C_d of a venturi meter lies within the limits
- (A) 0.7–0.9
 - (B) 0.6–0.8
 - (C) 0.75–0.95
 - (D) 0.95–0.99
79. In an open-channel flow, the mean velocity across a cross-section of the channel occurs at
- (A) 0.4 depth from free surface
 - (B) 0.6 depth from free surface
 - (C) 0.5 depth from free surface
 - (D) 0.2 depth from free surface
80. Turbidity meter is used to measure
- (A) suspended solids
 - (B) dissolved solids
 - (C) total dissolved solids
 - (D) volatile solids
81. The total energy line lies over the hydraulic gradient line by an amount which is equal to
- (A) velocity head
 - (B) pressure head
 - (C) friction head
 - (D) datum head
82. Which of the following is not a hydraulic failure of the earth dams?
- (A) Toe erosion
 - (B) Wave erosion
 - (C) Overtopping
 - (D) Sloughing
83. The horizontal angle which a line makes with the true meridian through one of the extremities of the line is called
- (A) bearing
 - (B) true bearing
 - (C) magnetic bearing
 - (D) imaginary bearing
84. Trickling filters are used to remove
- (A) suspended solids
 - (B) colloidal solids
 - (C) organic matter
 - (D) pathogenic bacteria

85. Acid rain is caused by
- (A) nitrogen and carbon
 - (B) sulphur and nitrogen
 - (C) phosphorus and carbon
 - (D) sulphur and phosphorus
86. Two rolling loads 160 kN and 90 kN, 4 m apart, are moving on a simply supported beam of span 12 m. The absolute maximum shear force will be
- (A) 160 kN
 - (B) 250 kN
 - (C) 220 kN
 - (D) 50 kN
87. A suspension bridge with a 2-hinged stiffening girder is statically
- (A) determinate
 - (B) indeterminate to 1 degree
 - (C) indeterminate to 2 degrees
 - (D) indeterminate to 3 degrees
88. Phreatic line in an earth dam is
- (A) straight line
 - (B) parabolic
 - (C) circular
 - (D) elliptical
89. Westergaard's analysis for stress distribution beneath loaded area is applicable to
- (A) sandy soil
 - (B) clayey soil
 - (C) stratified soil
 - (D) silty soil
90. The length of engineer's chain should be
- (A) 20 m
 - (B) 66 ft
 - (C) 100 ft
 - (D) 30 m
91. The soil transported by flowing water is called
- (A) aeolian soil
 - (B) alluvial soil
 - (C) marine soil
 - (D) lacustrine soil
92. The maximum area of tension reinforcement in a beam shall not exceed
- (A) $0.02bD$
 - (B) $0.04bD$
 - (C) $0.08bD$
 - (D) $1.0bD$

93. The subsurface water obtained under pressure is generally known as
- (A) open well
 - (B) tube well
 - (C) artesian well
 - (D) infiltration well
94. The error in measured length due to sag of chain or tape is known as
- (A) positive error
 - (B) negative error
 - (C) compensation error
 - (D) instrumental error
95. A prismatic compass is used to determine
- (A) dip at a place
 - (B) declination of a line
 - (C) whole circle bearing of a line
 - (D) quadrantal bearing of a line
96. One cubic meter of mild steel weighs about
- (A) 1000 kg
 - (B) 3625 kg
 - (C) 7850 kg
 - (D) 12560 kg
97. The force polygon representation of a set of forces in equilibrium is
- (A) open polygon
 - (B) closed polygon
 - (C) parallelogram
 - (D) triangle
98. When the plasticity index of a soil is zero, the soil is
- (A) clay
 - (B) silt
 - (C) sand
 - (D) silty sand
99. Intensity of rainfall is
- (A) the total rainfall in a period
 - (B) the rainfall per unit area
 - (C) the volume of water collected per unit time
 - (D) the depth of rainfall per unit time during which it fell
100. The stiffness method in structural analysis is also known as
- (A) unit load method
 - (B) force method
 - (C) displacement method
 - (D) consistent deformation method

SPACE FOR ROUGH WORK

SEAL

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. :

Series

01725

TEST BOOKLET

MECHANICAL ENGINEERING



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

1. The name of the Subject, Roll Number as mentioned in the Admission Certificate, Test Booklet No. and Series are to be written legibly and correctly in the space provided on the Answer-Sheet with Black/Blue ballpoint pen.
2. Answer-Sheet without marking Series as mentioned above in the space provided for in the Answer-Sheet shall not be evaluated.
3. All questions carry equal marks.

The Answer-Sheet should be submitted to the Invigilator.

Directions for giving the answers : Directions for answering questions have already been issued to the respective candidates in the 'Instructions for marking in the OMR Answer-Sheet' along with the Admit Card and Specimen Copy of the OMR Answer-Sheet.

Example :

Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. In a compound lever, the leverages of all the simple levers are

(A) added
(B) subtracted
(C) multiplied
(D) divided

2. The resultant of two forces P and Q acting at an angle θ is equal to

(A) $\sqrt{P^2 + Q^2 + 2PQ \sin \theta}$

(B) $\sqrt{P^2 + Q^2 + 2PQ \cos \theta}$

(C) $\sqrt{P^2 + Q^2 - 2PQ \sin \theta}$

(D) $\sqrt{P^2 + Q^2 - 2PQ \cos \theta}$

3. The maximum efficiency of a lifting machine is

(A) $\frac{1}{m}$

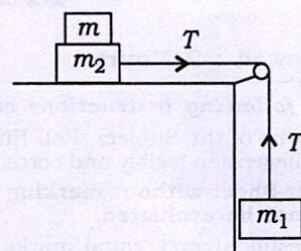
(B) $\frac{VR}{m}$

(C) $\frac{m}{VR}$

(D) $\frac{1}{m \times VR}$

where m = mechanical advantage
and VR = velocity ratio.

4. Two masses of $m_1 = 5$ kg and $m_2 = 10$ kg, connected by an inextensible string over frictionless pulley, are moving as shown in the figure below. The coefficient of friction of the horizontal surface is 0.15. The minimum weight m that should be put on the top of m_2 to stop the motion is



(A) 10.3 kg
(B) 18.3 kg
(C) 27.3 kg
(D) 43.3 kg

5. Two bodies A and B are projected upwards such that the velocity of A is double the velocity of B . Then, the ratio of heights to which the body A and body B will rise, is

(A) 2 (B) 4
(C) 6 (D) 8

6. The equation for a simple harmonic motion is given by $x(t) = 10 \sin(5t)$. The maximum velocity is

(A) 10
(B) 50
(C) 250
(D) 500

7. A man is pulling a bucket of water up to the roof of a building of 6 m height. The total weight of the rope is 20 N and the weight of the bucket with water is 100 N. The work done by the man is
- 420 N-m
 - 660 N-m
 - 720 N-m
 - 800 N-m
8. A body of mass 20 kg is initially at a height of 3 m above the ground. It is lifted to a height of 2 m from that position. Its increase in potential energy is
- 60 J
 - 100 J
 - 392 J
 - 100 J
9. A body of mass 10 kg is moving at a height of 2 m with uniform speed of 2 m/s. Its total energy is
- 392 J
 - 316 J
 - 216 J
 - 116 J
10. The work-energy theorem is a scalar form of
- Newton's first law
 - Newton's second law
 - Newton's third law
 - None of the above
11. The work done by friction over a closed path is
- always zero
 - always positive
 - always negative
 - non-zero and negative
12. The number of degrees of freedom in a planar mechanism having n links and j simple hinge joints is
- $3(n - 3) - 2j$
 - $3(n - 1) - 2j$
 - $3n - 2j$
 - $2j - 3n + 4$
13. A framed structure is perfect, if the number of members is _____ ($2j - 3$), where j is the number of joints.
- equal to
 - less than
 - greater than
 - Either (A) or (C)
14. What does the term 'kinematic pair' mean in the context of theory of machines?
- A pair of gears in mesh
 - Two or more links having motion relative to each other
 - A pair of bearings supporting a shaft
 - A set of cams and followers

15. A redundant frame is also called _____ frame.

- (A) perfect
- (B) imperfect
- (C) deficient
- (D) None of the above

16. The shape of the shear stress distribution across a rectangular cross-section beam is

- (A) triangular
- (B) parabolic
- (C) rectangular
- (D) a combination of rectangular and parabolic shape

17. The shear stress on principal planes is

- (A) equal to principal stress
- (B) half of principal stress
- (C) zero
- (D) maximum

18. For a simply supported beam of length L , the bending moment M is described as

$$M = a \left(x - \frac{x^3}{L^2} \right), \quad 0 \leq x \leq L$$

where a is constant. The shear force will be zero at

- (A) supports
- (B) $x = \frac{L}{2}$
- (C) $x = \frac{L}{3}$
- (D) $x = \frac{L}{\sqrt{3}}$

19. Two bars of same size but of different materials are subjected to the same tensile force. If the bars have unit elongation in the ratio of 2 : 5, then the ratio of modulus of elasticity of the two materials will be

- (A) 4 : 3
- (B) 3 : 4
- (C) 5 : 2
- (D) 2 : 5

20. Young's modulus of elasticity and Poisson's ratio of a material are 1.25×10^2 MPa and 0.34 respectively. The modulus of rigidity of the material is

- (A) 0.9469×10^2 MPa
- (B) 0.8375×10^2 MPa
- (C) 0.4664×10^2 MPa
- (D) 0.4025×10^2 MPa

21. A thin-walled spherical shell is subjected to an internal pressure. If the radius of the shell is increased by 1% and the thickness is reduced by 1%, with the internal pressure remaining the same, the percentage change in the circumferential (hoop) stress is

- (A) 0
- (B) 1
- (C) 1.08
- (D) 2.02

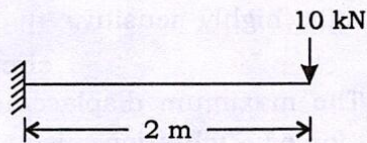
22. A cam with a roller follower would constitute which of the following types of pair?

- (A) Lower pair
- (B) Higher pair
- (C) Closed pair
- (D) Cam pair

23. Which one of the following is the correct expression for maximum shear stress induced in the wire of a close-coiled helical spring of wire diameter d and mean coil radius R which carries an axial load W ?

- (A) $\frac{16WR}{\pi d^3}$
- (B) $\frac{W}{\left(\frac{\pi d^2}{4}\right)}$
- (C) $\frac{(W/2)}{(\pi d^2/4)}$
- (D) $\frac{16WR}{\pi d}$

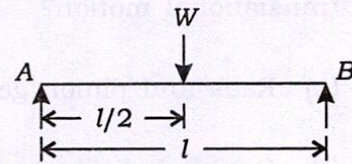
24. The shear force of the following diagram



is

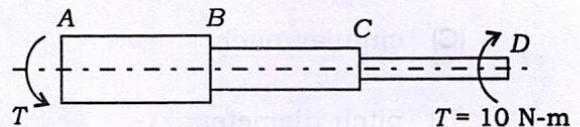
- (A) rectangle
- (B) square
- (C) circle
- (D) trapezoidal

25. Determine the maximum bending moment for the following figure :



- (A) Wl
- (B) $Wl/2$
- (C) $Wl/3$
- (D) $Wl/4$

26. A stepped shaft is used to transmit a torque of 10 N-m, as given in the figure below. The torsional stiffness of the sections AB, BC and CD are 60 N-m/rad, 30 N-m/rad and 20 N-m/rad, respectively. The angular deflection between the ends A and D of the shaft is



- (A) 1.0 rad
- (B) 10.0 rad
- (C) 0.5 rad
- (D) 5.0 rad

27. In the engineering stress-strain curve for mild steel, the ultimate tensile strength refers to

- (A) yield stress
- (B) proportional limit
- (C) maximum stress
- (D) fracture stress

28. Which of the following is used to convert a rotational motion into translational motion?

- (A) Rack and pinion gear
- (B) Double helical gear
- (C) Bevel gear
- (D) Worm gear

29. For full depth of involute spur gears, the minimum number of teeth on pinion to avoid interference depends upon

- (A) pressure angle
- (B) speed ratio
- (C) circular pitch
- (D) pitch diameter

30. What is the pitch circle diameter in gears?

- (A) The diameter of the gear
- (B) The diameter of the circle on which gear teeth are imagined to be concentrated
- (C) The outer diameter of the gear
- (D) The diameter of the circle through the gear center

31. In a differential gear of an automobile, the numbers of teeth on the crown gear and the pinion are 40 and 10, respectively. What is the gear ratio?

- (A) 4
- (B) 0.25
- (C) 10
- (D) 40

32. A long helical spring having a spring stiffness of 12 kN/m and the number of turns 20, breaks into two parts with number of turns 10 each in both the parts. If the two parts are connected in series, then the softness of the resultant spring will be

- (A) 6 kN/m
- (B) 12 kN/m
- (C) 24 kN/m
- (D) 30 kN/m

33. The problem of hunting of a centrifugal governor becomes very acute when the governor becomes

- (A) less stable
- (B) highly stable
- (C) less sensitive
- (D) highly sensitive

34. The maximum displacement due to forced vibration is _____ the displacement due to static force.

- (A) inversely proportional to
- (B) directly proportional to
- (C) independent to
- (D) None of the above

35. In forced vibrations, the magnitude of damping force at resonance is equal to the impressed force. It is

- (A) correct
- (B) incorrect
- (C) Can't say
- (D) Not always

36. What is the natural frequency of a mass-spring system with a mass of 2 kg and a spring stiffness of 100 N/m?

- (A) 3.5 rad/s
- (B) 5 rad/s
- (C) 7 rad/s
- (D) 10 rad/s

37. Calculate the critical damping coefficient in N/m/s for mass = 100 kg and $\omega = 10$ rad/s.

- (A) 5132
- (B) 6283
- (C) 7132
- (D) 8132

38. In a plate cam mechanism with reciprocating roller follower, the follower has a constant acceleration in the case of

- (A) cycloidal motion
- (B) simple harmonic motion
- (C) parabolic motion
- (D) 3-4-5 polynomial motion

39. Which of the following is **not** a type of rolling contact bearing?

- (A) Ball bearing
- (B) Needle bearing
- (C) Bush bearing
- (D) Taper roller bearing

40. Which of the following phases will be resulted when the transformation temperature of steel is in the range of 500 °C to 750 °C?

- (A) Austenite
- (B) Pearlite
- (C) Bainite
- (D) Martensite

41. Which of the following is the hardest?

- (A) Austenite
- (B) Pearlite
- (C) Bainite
- (D) Martensite

42. Which factor increases ductility?

- (A) Cold working
- (B) Annealing
- (C) Alloying
- (D) Inclusion

43. In solid-state welding, the contamination layers between the surfaces to be welded are removed by
- alcohol
 - plastic deformation
 - water jet
 - sand blasting
44. The ability of a material to undergo plastic deformation without fracture when subjected to uniaxial tensile force is
- ductility
 - malleability
 - tensile strength
 - yield strength
45. Using the Taylor's tool life equation with exponent $n = 0.5$, if the cutting speed is reduced by 50%, the ratio of new tool life to original tool life is
- 4
 - 2
 - 1
 - 0.5
46. In tool signature, the first figure represents
- back rake angle
 - end relief angle
 - side rake angle
 - side relief angle
47. In a linear arc welding process, the heat input per unit length is inversely proportional to
- welding current
 - duty cycle of the power source
 - welding voltage
 - welding speed
48. Which two of the following joining processes are autogenous?
- Diffusion welding
 - Electroslag welding
 - Tungsten inert gas welding
 - Friction welding
- (i) and (iv)
 - (ii) and (iii)
 - (ii) and (iv)
 - (i) and (iii)
49. Oxygen to acetylene ratio in case of carburizing flame is
- 2 : 1
 - 0.9 : 1
 - 1 : 1
 - 1 : 1.2
50. It is desired to make a product having T-shaped cross-section from a rectangular aluminium block. Which one of the following processes is expected to provide the highest strength of the product?
- Welding
 - Casting
 - Metal forming
 - Machining

51. In a rolling process, the state of stress of the material undergoing deformation is
- pure compression
 - pure shear
 - compression and shear
 - tension and shear
52. A toothpaste tube can be produced by
- hollow backward extrusion
 - solid backward extrusion
 - hollow forward extrusion
 - solid forward extrusion
53. Which of the following components withstands the high temperature in casting process?
- Clay
 - Moisture
 - Silica
 - Water
54. In lathe work, when the tool is fed parallel to the rotation of job work, it will produce
- spherical surface
 - cylindrical surface
 - tapered surface
 - All of the above
55. Time study is the
- appraisal, in terms of time, of the value of work involving human effort
 - machine setting time
 - time taken by workers to do a job
 - method of fixing time for workers
56. Work study is done with the help of
- process chart
 - planning chart
 - stopwatch
 - All of the above
57. Break-even analysis is a/an
- long-term analysis
 - average of short-term and long-term analysis
 - short-term analysis
 - Any one of the above
58. For a small-scale industry manufacturing toys, the total fixed investments required in a particular year is ₹ 50,000. The variable cost per toy is ₹ 20. If each toy is sold at ₹ 30, the break-even production per year will be
- 300
 - 400
 - 500
 - 600

59. The forecast and actual sales of a product during the month of November 2025 were 25 and 20, respectively. Using an exponential smoothing constant of 0.2, determine the sales forecast for December 2025.

- (A) 27
- (B) 24
- (C) 23
- (D) 21

60. Which of the following is a qualitative method of demand forecasting?

- (A) Regression
- (B) Exponential smoothing
- (C) Delphi technique
- (D) All of the above

61. Delphi method is used for

- (A) judgmental forecasting
- (B) time-series forecasting
- (C) associative model
- (D) All of the above

62. Scheduling gives information about

- (A) when work should start and how much work should be completed during a certain period
- (B) when work should complete
- (C) how idle time can be minimized
- (D) proper utilization of machines

63. Gantt chart provides information about the

- (A) material handling
- (B) proper utilization of manpower
- (C) production schedule
- (D) efficient working of machine

64. Statistical quality control techniques are based on the theory of

- (A) quality
- (B) statistics
- (C) probability
- (D) All of the above

65. By technological innovations, if the cost of raw material is reduced, this will result in

- (A) high break-even point
- (B) lower break-even point
- (C) increased profits
- (D) reduced profits

66. If D = duration, EF = earliest finish time, ES = earliest start time, LF = latest finish time, LS = latest start time, which relationship does **not** hold?

- (A) $EF = D - ES$
- (B) $EF = D + ES$
- (C) $LF = LS + D$
- (D) None of the above

67. The condition of perfect vacuum, i.e., absolute zero pressure can be attained at
- (A) a temperature of $-273.16\text{ }^{\circ}\text{C}$
 - (B) a temperature of $0\text{ }^{\circ}\text{C}$
 - (C) a temperature of 273 K
 - (D) Can't be attained
68. Boyle's law, i.e., $PV = \text{constant}$ is applicable to gases under
- (A) all ranges of pressures
 - (B) only small range of pressures
 - (C) high range of pressures
 - (D) atmospheric conditions
69. Which law states that the specific heat of a gas remains constant at all temperatures and pressures?
- (A) Charles' law
 - (B) Joule's law
 - (C) Regnault's law
 - (D) Boyle's law
70. According to which law, all perfect gases change in volume by $\left(\frac{1}{273}\right)^{\text{rd}}$ of their original volume at $0\text{ }^{\circ}\text{C}$ for every $1\text{ }^{\circ}\text{C}$ change in temperature when pressure remains constant?
- (A) Joule's law
 - (B) Boyle's law
 - (C) Gay-Lussac's law
 - (D) Charles' law
71. A perfect gas at $27\text{ }^{\circ}\text{C}$ is heated at a constant pressure till its volume is doubled. The final temperature is
- (A) $54\text{ }^{\circ}\text{C}$
 - (B) $327\text{ }^{\circ}\text{C}$
 - (C) $108\text{ }^{\circ}\text{C}$
 - (D) $654\text{ }^{\circ}\text{C}$
72. The change in enthalpy of a system is the heat supplied at
- (A) constant pressure
 - (B) constant temperature
 - (C) constant volume
 - (D) constant entropy

- 73.** Total heat is the heat required to
- (A) change vapour into liquid
 - (B) change liquid into vapour
 - (C) convert water into steam
 - (D) convert saturated steam into dry steam

- 74.** Rankine efficiency of a steam power plant

- (A) improves in summer as compared to that in winter
- (B) improves in winter as compared to that in summer
- (C) is unaffected by climatic conditions
- (D) None of the above

- 75.** Morse test can be conducted for

- (A) petrol engines
- (B) diesel engines
- (C) multi-cylinder engines
- (D) All of the above

- 76.** The thermal efficiency of petrol and gas engines is about

- (A) 15%
- (B) 30%
- (C) 50%
- (D) 70%

- 77.** Air-fuel ratio for idling speed of a petrol engine is approximately

- (A) 1 : 1
- (B) 5 : 1
- (C) 10 : 1
- (D) 15 : 1

- 78.** The output of a diesel engine can be increased without increasing the engine revolution or size in which of the following ways?

- (A) Feeding more fuel
- (B) Heating incoming air
- (C) Scavenging
- (D) Supercharging

- 79.** Iso-octane (C_8H_{18}) has the octane number of

- (A) 0
- (B) 50
- (C) 100
- (D) 120

- 80.** The actual volume of fresh charge admitted in 4-stroke petrol engine is

- (A) equal to stroke volume
- (B) equal to stroke volume and clearance volume
- (C) less than stroke volume
- (D) more than stroke volume

81. The inlet valve of a 4-stroke cycle internal combustion engine remains open for

- (A) 130°
- (B) 180°
- (C) 230°
- (D) 170°

82. In order to eliminate knocking in compression ignition engines, there should be

- (A) short delay period
- (B) late auto-ignition
- (C) low compression ratio
- (D) high self-ignition temperature of fuel

83. What is the main advantage of using a multi-cylinder engine over a single-cylinder engine?

- (A) Simpler construction
- (B) Higher power output
- (C) Lower manufacturing cost
- (D) Easier maintenance

84. After taking a bath during the hot summer, the body's

- (A) internal energy decreases
- (B) internal energy increases
- (C) heat decreases
- (D) No change in internal energy and heat

85. Heat transfer takes place as per the

- (A) zeroth law of thermodynamics
- (B) first law of thermodynamics
- (C) second law of thermodynamics
- (D) third law of thermodynamics

86. The insulation ability of an insulator with the presence of moisture

- (A) would increase
- (B) would decrease
- (C) remains unaffected
- (D) may increase/decrease depending on temperature and thickness of insulation

87. Which of the following is a case of steady-state heat transfer?

- (A) IC engine
- (B) Air preheater
- (C) Heating of building in winter
- (D) None of the above

88. Heat is transferred by all three modes of transfer, viz., conduction, convection and radiation in

- (A) electric heater
- (B) steam condenser
- (C) refrigerator condenser coils
- (D) boiler

89. In a reciprocating pump, air vessels are used to

- (A) smoothen the flow
- (B) reduce suction head
- (C) increase delivery head
- (D) reduce acceleration head

90. Head developed by a centrifugal pump is

- (A) proportional to the diameter of impeller
- (B) proportional to the speed of impeller
- (C) proportional to the diameter and speed of impeller
- (D) None of the above

91. The cavitation in a hydraulic machine

- (A) causes noise and vibration of various parts
- (B) reduces the discharge of a turbine
- (C) causes sudden drop in power output and efficiency
- (D) All of the above

92. Which of the following pumps is successfully used for lifting water from the wells?

- (A) Centrifugal pump
- (B) Reciprocating pump
- (C) Jet pump
- (D) Air-lift pump

93. The expansion of steam, as it flows over the blades in the reaction turbine, represents

- (A) isothermal process
- (B) isentropic process
- (C) throttling process
- (D) free-expansion process

94. Which of the following statements is correct?

- (A) The efficiency of steam turbines is greater than steam engines.
- (B) A flywheel is a must for steam turbine.
- (C) The turbine blades do not change the direction of steam issuing from the nozzle.
- (D) The pressure of steam, in reaction turbines, is increased in fixed blades as well as in moving blades.

95. In an impulse turbine, steam expands
- (A) wholly in blades
 - (B) wholly in nozzle
 - (C) partly in nozzle and partly in blades
 - (D) None of the above
96. The maximum efficiency in impulse steam turbine is
- (A) $2 \cos \alpha$
 - (B) $\cos 2\alpha$
 - (C) $\cos (\alpha / 2)$
 - (D) $\cos^2 \alpha$
97. The COP of a Carnot refrigerator in winter will be _____ as compared to COP in summer.
- (A) same
 - (B) lower
 - (C) higher
 - (D) None of the above
98. The ratio of actual mass of water vapour in a given volume of moist air to the mass of water vapour in the same volume of saturated air at the same temperature and pressure is called
- (A) humidity ratio
 - (B) relative humidity
 - (C) absolute humidity
 - (D) degree of saturation
99. During sensible cooling of air, _____ decreases.
- (A) wet-bulb temperature
 - (B) relative humidity
 - (C) dry-bulb temperature
 - (D) specific humidity
100. When—
- H_1 = Total heat of air entering the coil (heating or cooling)
 H_2 = Total heat of air leaving the coil (heating or cooling)
 H_3 = Total heat of air at the end of the process (humidification or dehumidification)
- then the sensible heat factor $\frac{(H_2 - H_1)}{(H_3 - H_1)}$ represents the process of
- (A) heating and humidification
 - (B) heating and dehumidification
 - (C) cooling and humidification
 - (D) cooling and dehumidification

SPACE FOR ROUGH WORK

SEAL

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

Test Booklet No. :

Series

00385

TEST BOOKLET

CHEMICAL ENGINEERING



Time Allowed : 2 Hours

Full Marks : 100

Read the following instructions carefully before you begin to answer the questions :

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Suppose the following question is asked :

The capital of Bangladesh is

- (A) Chennai
- (B) London
- (C) Dhaka
- (D) Dhubri

You will have four alternatives in the Answer-Sheet for your response corresponding to each question of the Test Booklet as below :

(A) (B) (C) (D)

In the above illustration, if your chosen response is alternative (C), i.e., Dhaka, then the same should be marked on the Answer-Sheet by blackening the relevant circle with a Black/Blue ballpoint pen only as below :

(A) (B) (C) (D)

The example shown above is the only correct method of answering.

4. Use of eraser, blade, chemical whitener fluid to rectify any response is prohibited.
5. Please ensure that the Test Booklet has the required number of pages (16) and 100 questions immediately after opening the Booklet. In case of any discrepancy, please report the same to the Invigilator.
6. No candidate shall be admitted to the Examination Hall/Room 20 minutes after the commencement of the examination.
7. No candidate shall leave the Examination Hall/Room without prior permission of the Supervisor/ Invigilator. No candidate shall be permitted to hand over his/her Answer-Sheet and leave the Examination Hall/Room before expiry of the full time allotted for each paper.
8. No Mobile Phone, Electronic Communication Device, etc., are allowed to be carried inside the Examination Hall/Room by the candidates. Any Mobile Phone, Electronic Communication Device, etc., found in possession of the candidate inside the Examination Hall/Room, even if on off mode, shall be liable for confiscation.
9. No candidate shall have in his/her possession inside the Examination Hall/Room any book, notebook or loose paper, except his/her Admission Certificate and other connected papers permitted by the Commission.
10. Complete silence must be observed in the Examination Hall/Room. No candidate shall copy from the paper of any other candidate, or permit his/her own paper to be copied, or give, or attempt to give, or obtain, or attempt to obtain irregular assistance of any kind.
11. This Test Booklet can be carried with you after answering the questions in the prescribed Answer-Sheet.
12. Noncompliance with any of the above instructions will render a candidate liable to penalty as may be deemed fit.
13. No rough work is to be done on the OMR Answer-Sheet. You can do the rough work on the space provided in the Test Booklet.

N.B. : There will be negative marking @ 0.25 per 1 (one) mark against each wrong answer.

1. Portland cement consists mainly of

- (A) CaO and SiO_2
- (B) Al_2O_3 and Fe_2O_3
- (C) Fe_2O_3 and CaSO_4
- (D) CaSO_4 and Al_2O_3

2. During clinker production, the raw material is heated in a rotary kiln at approximately

- (A) 3000°C
- (B) 1450°C
- (C) 750°C
- (D) 550°C

3. The clinker is a/an

- (A) waste product in cement production
- (B) valuable product of biomass gasification
- (C) product obtained after adding additives to cement
- (D) intermediate product in cement production before adding additives to cement

4. Gypsum is a crucial mineral added to cement during grinding to

- (A) decrease the volatility of cement
- (B) decrease the setting rate of cement
- (C) increase the setting rate of cement
- (D) increase the density of cement

5. Which of the following is **not** a key constituent of cement clay?

- (A) Silica
- (B) Alumina
- (C) Ammonia
- (D) Iron oxide

6. C_3S (tricalcium silicate) is responsible for

- (A) early strength gain of concrete
- (B) long-term, ultimate strength of concrete
- (C) color and sulfate resistance of cement
- (D) rapid setting of cement

7. 18.066×10^{23} atoms of oxygen contain

- (A) 1 mole of oxygen
- (B) 2 moles of oxygen
- (C) 3 moles of oxygen
- (D) 4 moles of oxygen

8. If the specific gravity of crude oil fraction collected from a depth of 9768 ft to 9774 ft is 0.9 (at 15.6°C), what will be its API gravity?

- (A) 32.59
- (B) 25.72
- (C) 27.79
- (D) 19.30

9. "The total volume of a non-reacting gas mixture at constant temperature and pressure is the sum of the individual partial volumes each gas would occupy if it were alone under those same conditions." This is the statement of
- Amagat's law
 - Dalton's law
 - Henry's law
 - Kirchhoff's law
10. For an ideal diatomic gas, the molar specific heat at constant volume (C_v) is typically
- R
 - $2R$
 - $2.5R$
 - $3.5R$
11. 1 centipoise is equivalent to
- 0.001 Pa.s
 - 0.01 Pa.s
 - 0.01 kg/(m.s)
 - 0.001 kg/(cm.s)
12. The volume occupied by one gram mole of a gas at STP is
- 22.4 cc
 - 22.4 litres
 - 22400 litres
 - 220.4 litres
13. Which of the following is a ferromagnetic material?
- Aluminium
 - Copper
 - Cobalt
 - Lead
14. The depth of hardness of steel can be increased by the addition of
- chromium
 - nickel
 - calcium
 - tungsten
15. Which of the following metals does **not** react violently with water?
- K
 - Na
 - Ca
 - Au
16. Duralumin is an alloy of
- Al, Mg, Mn, Si
 - Al, Cu, Mg, Mn
 - Cu, Mg, Mn, Ti
 - Ca, Mg, Mn, C

17. Which element is added to improve the hardness and wear resistance of steel alloy?

- (A) Nickel
- (B) Titanium
- (C) Tungsten
- (D) Manganese

18. No cutting fluid is normally used while machining

- (A) mild steel
- (B) stainless steel
- (C) aluminium
- (D) cast iron

19. Fine-grained steels generally exhibit

- (A) higher ductility
- (B) lower strength
- (C) lower toughness
- (D) higher brittleness

20. An ideal fluid

- (A) is always compressible
- (B) obeys Newton's law of viscosity
- (C) is frictionless and incompressible
- (D) exhibits high viscosity

21. An example of dilatant fluid is

- (A) sewage sludge
- (B) rubber latex
- (C) quicksand
- (D) Both (A) and (B)

22. The Navier-Stokes equation is derived from the fundamental principle of

- (A) conservation of energy
- (B) conservation of mass
- (C) conservation of momentum
- (D) Newton's law of viscosity

23. Bernoulli's equation describes the

- (A) potential energy balance in laminar flow
- (B) mechanical energy balance in laminar flow
- (C) mechanical energy balance in boundary layer
- (D) mechanical energy balance in potential flow

24. Drag coefficient C_D , in Stokes' law range, is given by

- (A) $C_D = \text{Re}_p / 16$
- (B) $C_D = \text{Re}_p / 6$
- (C) $C_D = 16 / \text{Re}_p$
- (D) $C_D = 24 / \text{Re}_p$

25. The velocity profile for turbulent flow through a closed conduit is generally

- (A) linear
- (B) logarithmic
- (C) parabolic
- (D) hyperbolic

26. Cavitation happens when

- (A) $NPSH_{\text{available}} = 0$
- (B) $NPSH_{\text{available}} = NPSH_{\text{required}}$
- (C) $NPSH_{\text{available}} < NPSH_{\text{required}}$
- (D) $NPSH_{\text{available}} > NPSH_{\text{required}}$

[where $NPSH$ = Net Positive Suction Head]

27. Priming is needed in a

- (A) gear pump
- (B) vane pump
- (C) centrifugal pump
- (D) reciprocating pump

28. A gear pump is used for fluids with

- (A) suspended solids
- (B) high viscosity
- (C) abrasive materials
- (D) shear-sensitive liquids

29. Which of the following produces maximum pressure difference for transportation of gases?

- (A) Reciprocating pump
- (B) Fan
- (C) Blower
- (D) Compressor

30. The Reynolds' number (Re) for pipe flow is independent of the

- (A) length of the pipe
- (B) fluid density
- (C) pipe diameter
- (D) viscosity of the fluid

31. In constant pressure filtration

- (A) resistance decreases with time
- (B) rate of filtration is constant
- (C) rate of filtration decreases with time
- (D) rate of filtration increases with time

32. The rate of filtration does **not** depend on

- (A) area of filtering surface
- (B) viscosity of the filtrate
- (C) resistance of the filter medium
- (D) density of the filtrate

33. The purpose of flocculation after coagulation is to

- (A) destabilize particles
- (B) remove organic matter
- (C) form large, settleable flocs
- (D) kill bacteria

34. The fundamental principle behind sedimentation is

- (A) centrifugal force
- (B) surface tension
- (C) distillation
- (D) gravity

35. Swirling and vortex formation in agitator can be prevented by

- (A) dissolving salt in the solvent
- (B) using baffles
- (C) using non-toxic fluid
- (D) increasing the heat transfer rate during agitation

36. Mach number is defined as

- (A) speed of sound/speed of fluid
- (B) speed of sound/rate of heat flow
- (C) speed of fluid/speed of sound
- (D) speed of fluid/rate of heat flow

37. Tertiary treatment of sewage removes

- (A) large solids
- (B) dissolved and colloidal organic matter
- (C) grease
- (D) heavy metals

38. The presence of nitrogen in a wastewater sample is due to the decomposition of

- (A) fats
- (B) carbohydrates
- (C) proteins
- (D) vitamins

39. Eutrophication of lakes is primarily caused by

- (A) increase in bacterial growth rate
- (B) excessive inflow of nutrients
- (C) increase in flow rate of water
- (D) thermal and density currents

40. Water pollution is **not** caused by

- (A) exhaust emission from internal combustion engine
- (B) oxygen demanding wastes
- (C) fertilizers used in crop field
- (D) pathogenic bacteria

41. Which of the following materials can be considered as a non-biodegradable waste?
- (A) Synthetic fiber
 - (B) Rice straw
 - (C) Wood
 - (D) Paper
42. Disinfection of water may be done by
- (A) filtration
 - (B) using chemicals like phenyl
 - (C) using ultraviolet radiation
 - (D) fractional distillation
43. Oil and grease present in an emulsified state in wastewater discharged from industries can be removed by
- (A) biological oxidation
 - (B) coagulation/flocculation (adding chemical reagents)
 - (C) chlorination
 - (D) using UV light
44. Which of the following is **not** a chemical coagulant?
- (A) Alum
 - (B) Polyaluminum chloride (PAC)
 - (C) Sulfur dioxide
 - (D) Ferric sulfate
45. Polluted water having low biochemical oxygen demand (BOD) is most economically treated using
- (A) sedimentation tank
 - (B) oxidation pond
 - (C) sludge digester
 - (D) clarifier
46. The process of lagooning is primarily a means of
- (A) disposing sludge
 - (B) increasing the capacity of storage reservoirs
 - (C) reducing the excessive flow in sewers
 - (D) increasing the flow of sewage through tanks
47. The biochemical treatment of sewage effluents is essentially a process of
- (A) polymerization
 - (B) aromatization
 - (C) oxidation
 - (D) reduction
48. Which of the following represents the physical characteristics of water?
- (A) BOD
 - (B) COD
 - (C) Turbidity
 - (D) Chloride content

49. An oxidizing agent used in COD test for samples of wastewater is

- (A) potassium dichromate
- (B) potassium chloride
- (C) potassium chromate
- (D) potassium hydroxide

50. BOD of wastewater is determined under standardized conditions, most commonly by incubating a sample in the dark at

- (A) 20 °C for 7 days
- (B) 20 °C for 5 days
- (C) 25 °C for 7 days
- (D) 25 °C for 5 days

51. Which of the following is an end product formed from both the aerobic and anaerobic decompositions of organic matter?

- (A) CH_4
- (B) CO_2
- (C) H_2S
- (D) NH_3

52. The gas from sludge digestion tank is mainly composed of

- (A) CH_4
- (B) H_2S
- (C) CO_2
- (D) CO

53. In petroleum industries, dissolved air floatation process is used for

- (A) dewatering of sludge
- (B) recovery of oil from sludge
- (C) toxic material removal from sludge
- (D) sludge thickening

54. Petroleum-bearing rocks are

- (A) igneous rocks
- (B) metamorphic rocks
- (C) sedimentary rocks
- (D) magma

55. Which of the following is a common seal or cap rock?

- (A) Shale
- (B) Igneous
- (C) Metamorphic
- (D) Trap

56. Permeability of sedimentary rock indicates

- (A) the amount of hydrocarbon present in a rock
- (B) characteristics of cap rock
- (C) properties of the traps
- (D) how easily a formation permits a hydrocarbon fluid to flow through it

57. Which of the following is **not** responsible for causing permanent hardness of water?

- (A) MgCl_2
- (B) CaSO_4
- (C) $\text{Mg}(\text{HCO}_3)_2$
- (D) MgSO_4

58. Which of the following components of petroleum drilling provides the hoisting and breaking power to lift and lower the heavy weights of drill string and casings?

- (A) Draw work
- (B) Mud pump
- (C) Kelly
- (D) Christmas tree

59. Stratigraphic trap is formed

- (A) by deformation of the beds after they were deposited, either by folding or faulting
- (B) by changes in the nature of the rocks themselves or in their layering
- (C) due to water flowing through the reservoir
- (D) partly by structural and partly by stratigraphic effects

60. The function of Kelly in hydrocarbon drilling rig is to

- (A) control the flow rate of the drilling fluid before entering into the drill string
- (B) provide a high-pressure seal
- (C) provide rotation of the drill string
- (D) provide safety line to seal a well and stop uncontrolled releases

61. Christmas tree is a/an

- (A) single cylinder CI engine system
- (B) high head turbine
- (C) electric generator
- (D) multi-valved structure

62. Which of the following is **not** a function of casing in hydrocarbon production?

- (A) It controls the formation pressure
- (B) It confines production to the wellbore
- (C) It provides an anchor for surface equipment
- (D) It accelerates the rate of fracturing of the upper and weaker zone

63. A jack-up (self-elevating) rig generally operates in water at a depth of around

- (A) 350 ft
- (B) 1300 ft
- (C) 2500 ft
- (D) 4350 ft

64. Which of the following is a floater-type drilling rig?

- (A) Leg-type
- (B) Mat-type
- (C) Semi-submersible
- (D) Jack-up

65. Limited hydrocarbon producing rate may be a result of

- (A) good reservoir permeability
- (B) excessive back pressure on formation
- (C) adequate artificial lift
- (D) sufficient reservoir pressure for depth

66. Which of the following products is typically stored in a floating roof tank?

- (A) Bitumen
- (B) Water
- (C) Liquid oxygen
- (D) Gasoline

67. Which of the following statements about fixed roof tank is correct?

- (A) Fixed roof tanks are the most expensive tanks.
- (B) Fixed roof tanks are mainly used for storing low-pressure liquids such as diesel.
- (C) The roof of fixed roof tank is in contact with the liquid surface.
- (D) The emissions from the fixed roof tank are generally less than that of floating roof tanks.

68. One of the major disadvantages of hydro-power is that

- (A) power generation is dependent on the quantity of water available which may vary from season to season and year to year
- (B) the running costs of hydro-power installation are very low as compared to thermal and nuclear power stations
- (C) the problem of emission of polluting gases and particulates to the atmosphere mostly does not exist
- (D) being simple in design and operation, the hydro-power plants do not require highly skilled workers

69. High-head hydroelectric power plants work under a head of

- (A) 100 m or above
- (B) 50 m to 100 m
- (C) 30 m to 50 m
- (D) below 30 m

70. Which turbine converts the whole pressure energy into kinetic energy first?

- (A) Kaplan turbine
- (B) Francis turbine
- (C) Propeller turbine
- (D) Pelton wheel

71. A run-of-river plant with pondage can operate

- (A) as a base-load plant
- (B) as a peak-load plant
- (C) as both base-load and peak-load plants
- (D) only during high river flow

72. Which of the following is an example of reaction turbine?

- (A) Pelton wheel
- (B) Francis turbine
- (C) Banki-Michell turbine
- (D) Turgo turbine

73. A penstock in a hydro-power plant is a

- (A) rotating machine with blades that converts the energy of moving water (potential and kinetic) into mechanical, rotational energy, which then spins a generator to produce electricity
- (B) massive barrier built across a river to create a large, elevated reservoir, storing water to provide potential energy
- (C) large pipe or conduit that carries high-pressure water from a reservoir down to the turbine for electricity generation
- (D) protective reservoir that absorbs pressure surges, preventing water hammer damage and stabilizing water flow to the turbine during rapid load changes

74. Power number refers to

- (A) drag force/inertial force
- (B) inertial force/drag force
- (C) drag force/viscous force
- (D) buoyancy force/viscous force

75. A propeller agitator with a pitch of 1.0 is said to have

- (A) linear pitch
- (B) square pitch
- (C) rectangular pitch
- (D) orthorhombic pitch

76. Kinematic viscosity is defined as the ratio of

- (A) dynamic viscosity and density
- (B) dynamic viscosity and humidity
- (C) dynamic viscosity and pressure
- (D) flow rate and pressure

77. The unit of momentum flux is

- (A) kg/m s^2
- (B) kg m/s
- (C) m^2/s
- (D) Both (B) and (C)

78. For power-law fluids, the value of n for a pseudoplastic is

- (A) $n < 1$
- (B) $n > 1$
- (C) $n = 1$
- (D) Both (B) and (C)

79. The ratio of wall shear stress to the product of density and velocity head is

- (A) skin friction
- (B) fanning friction
- (C) form friction
- (D) drag

80. In Hagen-Poiseuille flow through a cylindrical tube, the radial profile of shear stress is

- (A) constant
- (B) parabolic
- (C) linear
- (D) cubic

81. The operating principle of a Bourdon gauge is based on

- (A) thermal expansion
- (B) change in electrical resistance
- (C) elastic deformation of a curved tube
- (D) fluid column height

82. The vortex in which the energy per unit mass of the liquid is constant is

- (A) forced vortex
- (B) free vortex
- (C) natural vortex
- (D) induced vortex

83. Which type of pump is suitable for handling liquids containing solid particles?

- (A) Cam pump
- (B) Vane pump
- (C) Flexible vane pump
- (D) Both (A) and (B)

84. Corrosion is

- (A) a reversible reaction
- (B) an irreversible interfacial reaction
- (C) a non-spontaneous reaction
- (D) None of the above

85. Match the following pumps with materials :

<i>Pump</i>	<i>Material</i>
P. Screw pump	1. Cement slurries
Q. Peristaltic pump	2. Biological fluids
R. Mono pump	3. Highly viscous polymer fluids
S. Centrifugal pump	4. Gritty fluids

Select the correct answer.

- (A) P Q R S
1 2 3 4
- (B) P Q R S
3 2 4 1
- (C) P Q R S
3 2 1 4
- (D) P Q R S
4 3 2 1

86. The range of coefficient of discharge (C_d) for a venturi meter is

- (A) 0.6 to 0.7
(B) 0.7 to 0.8
(C) 0.8 to 0.9
(D) 0.95 to 0.99

87. The volumetric efficiency for a reciprocating pump varies from

- (A) 10% to 20%
(B) 40% to 50%
(C) 90% to 100%
(D) None of the above

88. Zeta potential is determined by which of the following?

- (A) Mobility of colloidal particles under an applied electric field
(B) Stability of a colloidal system
(C) Surface charge on the particles
(D) All of the above

89. Most widely used solvent for dewaxing process of lubricating oils is

- (A) naphtha
(B) sodium plumbite
(C) methyl ethyl ketone (MEK)
(D) methyl isobutyl ketone (MIBK)

90. Which type of corrosion occurs in the presence of two dissimilar metals in electrical contact?

- (A) Galvanic corrosion
(B) Pitting corrosion
(C) Crevice corrosion
(D) Stress corrosion

91. Arsenic contamination in ground-water (specially in Assam) is primarily caused by

- (A) industrial effluents
(B) coal mining
(C) reductive dissolution of iron oxyhydroxide
(D) agricultural runoff

92. Which pollutant is mostly associated with endocrine disruption in aquatic organisms?

- (A) Cadmium
(B) Bisphenol A (BPA)
(C) Sulfate
(D) Chloride

93. In the oxygen sag curve, the lowest dissolved oxygen (DO) level occurs at

- (A) pollution zone
- (B) active decomposition zone
- (C) recovery zone
- (D) clean water zone

94. Low-heat cement is useful for

- (A) plastering in residential buildings
- (B) massive structure work
- (C) underwater construction
- (D) construction in tropical environment

95. Which type of cement is most suitable for construction having contact with seawater?

- (A) High early strength cement
- (B) Sulphate resistant cement
- (C) Low-heat cement
- (D) High-alumina cement

96. Thermal pollution in water bodies typically results in

- (A) increase in dissolved oxygen (DO)
- (B) decrease in biochemical oxygen demand (BOD)
- (C) decrease in dissolved oxygen (DO)
- (D) increase in salinity

97. Fluoride contamination in ground-water is most commonly associated with

- (A) basaltic rocks
- (B) granite rocks
- (C) peat soils
- (D) alluvial deposits

98. The primary purpose of agitation in liquid-liquid system is to

- (A) increase molecular diffusion
- (B) increase interfacial area between phases
- (C) reduce power consumption
- (D) minimize shear rate

99. Washing of filter cake is most efficient when

- (A) channels or cracks form within the cake
- (B) washing occurs at low flow rate
- (C) cake is uniform and incompressible
- (D) wash liquid has high viscosity

100. The main function of a shale shaker in the circulation system is to

- (A) remove sand sized particles
- (B) remove very fine silt particles
- (C) control gas entrainment
- (D) reduce annular friction pressure

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