

# National Testing Agency

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|------------------------------|---------------------------------------------------------------------|
| <b>Question Paper Name :</b> | Chemical thermal and Polymer Engineering<br>21st March 2024 Shift 3 |
| <b>Subject Name :</b>        | Chemical thermal and Polymer Engineering                            |
| <b>Creation Date :</b>       | 2024-03-21 22:44:25                                                 |
| <b>Duration :</b>            | 105                                                                 |
| <b>Total Marks :</b>         | 300                                                                 |
| <b>Display Marks:</b>        | Yes                                                                 |

## Chemical thermal and Polymer Engineering

|                                      |           |
|--------------------------------------|-----------|
| <b>Group Number :</b>                | 1         |
| <b>Group Id :</b>                    | 878270637 |
| <b>Group Maximum Duration :</b>      | 0         |
| <b>Group Minimum Duration :</b>      | 105       |
| <b>Show Attended Group? :</b>        | No        |
| <b>Edit Attended Group? :</b>        | No        |
| <b>Break time :</b>                  | 0         |
| <b>Group Marks :</b>                 | 300       |
| <b>Is this Group for Examiner? :</b> | No        |
| <b>Examiner permission :</b>         | Cant View |
| <b>Show Progress Bar? :</b>          | No        |

## Chemical thermal and Polymer Engineering

|                         |            |
|-------------------------|------------|
| <b>Section Id :</b>     | 8782701094 |
| <b>Section Number :</b> | 1          |

|                                                                     |            |
|---------------------------------------------------------------------|------------|
| <b>Section type :</b>                                               | Online     |
| <b>Mandatory or Optional :</b>                                      | Mandatory  |
| <b>Number of Questions :</b>                                        | 75         |
| <b>Number of Questions to be attempted :</b>                        | 75         |
| <b>Section Marks :</b>                                              | 300        |
| <b>Enable Mark as Answered Mark for Review and Clear Response :</b> | Yes        |
| <b>Maximum Instruction Time :</b>                                   | 0          |
| <b>Sub-Section Number :</b>                                         | 1          |
| <b>Sub-Section Id :</b>                                             | 8782701984 |
| <b>Question Shuffling Allowed :</b>                                 | Yes        |
| <b>Is Section Default? :</b>                                        | null       |

**Question Number : 1 Question Id : 87827052564 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Correct Marks : 4 Wrong Marks : 1**

At eutctic point, the number of phases present are

1. one
2. two
3. three
4. many

**Options :**

- 878270206841. 1
- 878270206842. 2
- 878270206843. 3
- 878270206844. 4

**Question Number : 2 Question Id : 87827052565 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following is an example of a closed system?

1. Scooter engine
2. Liquid cooling system of an automobile
3. Boiler in steam power plant
4. Air compressor

**Options :**

878270206845. 1

878270206846. 2

878270206847. 3

878270206848. 4

**Question Number : 3 Question Id : 87827052566 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The direction of a particular spontaneous process is ascertained from which of the following laws of thermodynamics?

1. zeroth law
2. first law
3. second law
4. third law

**Options :**

878270206849. 1

878270206850. 2

878270206851. 3

878270206852. 4

**Question Number : 4 Question Id : 87827052567 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Molar entropy of vaporization at normal boiling point in J/K mole is

1. 80
2. 90
3. 200
4. 92

**Options :**

878270206853. 1

878270206854. 2

878270206855. 3

878270206856. 4

**Question Number : 5 Question Id : 87827052568 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

For a reversible process at constant pressure and temperature, the free energy change is

1. greater than zero but less than one
2. less than zero
3. equal to zero
4. greater than one

**Options :**

878270206857. 1

878270206858. 2

878270206859. 3

878270206860. 4

**Question Number : 6 Question Id : 87827052569 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Gibbs free energy of mixing at constant temperature and pressure must always be

1. zero
2. positive
3. negative
4. infinity

**Options :**

878270206861. 1

878270206862. 2

878270206863. 3

878270206864. 4

**Question Number : 7 Question Id : 87827052570 Question Type : MCQ Option Shuffling : No Is**

**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Hess's law of constant heat summation is based on

1. zeroth law of thermodynamics
2. first law of thermodynamics
3. second law of thermodynamics
4. third law of thermodynamics

**Options :**

878270206865. 1

878270206866. 2

878270206867. 3

878270206868. 4

**Question Number : 8 Question Id : 87827052571 Question Type : MCQ Option Shuffling : No Is**  
**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Fugacity is most useful in

1. representing actual behaviour of real gases
2. representing actual behaviour of ideal gases
3. the study of chemical equilibria involving gases at atmospheric pressure
4. representing ideal behaviour of ideal gases

**Options :**

878270206869. 1

878270206870. 2

878270206871. 3

878270206872. 4

**Question Number : 9 Question Id : 87827052572 Question Type : MCQ Option Shuffling : No Is**  
**Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Which of the following statements is **not** valid for an ideal solution?

1. there is no volume change on mixing
2. there is no enthalpy change on mixing
3. there is no entropy change on mixing
4. fugacity is directly proportional to concentration

**Options :**

878270206873. 1

878270206874. 2

878270206875. 3

878270206876. 4

**Question Number : 10 Question Id : 87827052573 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Match List I with List II

| List 1              | List II            |
|---------------------|--------------------|
| (A) Heat            | (I) State function |
| (B) Internal energy | (II) Path function |
| (C) Work            |                    |
| (D) Entropy         |                    |

Choose the correct answer from the options given below:

1. A – II, B – I, C – I, D – I
2. A – II, B – I, C – II, D – II
3. A – II, B – II, C – I, D – I
4. A – II, B – I, C – II, D – I

**Options :**

878270206877. 1

878270206878. 2

878270206879. 3

878270206880. 4

**Question Number : 11 Question Id : 87827052574 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

For estimation of heat capacity of a solid compound, one can use;

1. Clapyron's equation
2. Gibb's equation
3. Koop's rule
4. Trouton's rule

**Options :**

878270206881. 1

878270206882. 2

878270206883. 3

878270206884. 4

**Question Number : 12 Question Id : 87827052575 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following statements is true?

1. Heat can be fully converted into work
2. Work cannot be fully converted into heat
3. The efficiency of a heat engine increases as the temperature of heat source is increased while keeping the temperature of the heat sink fixed.
4. A cyclic process can be devised whose sole effect is to transfer heat from a lower temperature to a higher temperature.

**Options :**

878270206885. 1

878270206886. 2

878270206887. 3

878270206888. 4

**Question Number : 13 Question Id : 87827052576 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The fluid forces considered in the Navier-Stokes equation are;

1. gravity, pressure and viscous
2. gravity, pressure and turbulent
3. pressure, viscous and turbulent
4. gravity, viscous and turbulent



**Options :**

- 878270206889. 1
- 878270206890. 2
- 878270206891. 3
- 878270206892. 4

**Question Number : 14 Question Id : 87827052577 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In order that the water shall never rise more than 100 cm above the crest for a discharge of 5 cubic meter per second, the length of the wire will be;

- 1. 1 metre
- 2. 2.5 metre
- 3. 2.49 metre
- 4. 2.51 metre

**Options :**

- 878270206893. 1
- 878270206894. 2
- 878270206895. 3
- 878270206896. 4

**Question Number : 15 Question Id : 87827052578 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Arrange the following flow measuring devices in the increasing order of heat loss caused by them;

- (A). Flow nozzle
- (B). Venturimeter
- (C). Orifice meter

Choose the *correct* answer from the options given below:

- 1. A, B, C
- 2. C, A, B
- 3. B, C, A
- 4. A, C, B

**Options :**

- 878270206897. 1
- 878270206898. 2
- 878270206899. 3
- 878270206900. 4

**Question Number : 16 Question Id : 87827052579 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Correct Marks : 4 Wrong Marks : 1**

Impeller diameter in case of turbine agitator is;

- 1. 5% less than the inside diameter of the vessel
- 2. 30 - 50% of inside diameter of the vessel
- 3. 60 - 75% of inside diameter of the vessel
- 4. Specification not required

**Options :**

- 878270206901. 1
- 878270206902. 2
- 878270206903. 3
- 878270206904. 4

**Question Number : 17 Question Id : 87827052580 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Crude oil of kinematic viscosity 2.25 Stokes flows through a 20 cm diameter pipe, if the rate of flow is 1.5 litre/sec, what will be the type of flow?

1. laminar
2. turbulent
3. uncertain
4. transition

**Options :**

878270206905. 1
878270206906. 2
878270206907. 3
878270206908. 4

**Question Number : 18 Question Id : 87827052581 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

A pressure of 500 kPa applied to 2 m<sup>3</sup> of liquid results in a volume change of 0.004 m<sup>3</sup>. The bulk modulus in Mpa is;

1. 2.5
2. 25
3. 250
4. 2500

**Options :**

878270206909. 1
878270206910. 2
878270206911. 3

**Question Number : 19 Question Id : 87827052582 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Bernoulli's equation cannot be applied when the flow is;

1. rotational
2. turbulent
3. unsteady
4. smooth

**Options :**

878270206913. 1

878270206914. 2

878270206915. 3

878270206916. 4

**Question Number : 20 Question Id : 87827052583 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Rain drops fall from a great height under gravity. Select the correct statement from the following;

1. Their velocities go on increasing until they hit the earth with the same velocity
2. Their velocities go on increasing as they hit the earth, but final velocities of different drops are different
3. They fall with a terminal velocity which is the same for every drop
4. They fall with terminal velocities which are different for drops of different size

**Options :**

878270206917. 1

878270206918. 2

878270206919. 3

878270206920. 4

**Question Number : 21 Question Id : 87827052584 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Industrial paddle agitators turn at speed between

1. 20 -100 rpm
2. 200-400 rpm
3. 650 - 850 rpm
4. 2000-2500 rpm

**Options :**

878270206921. 1

878270206922. 2

878270206923. 3

878270206924. 4

**Question Number : 22 Question Id : 87827052585 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following size reduction equipments can accept feed sizes of 10 inches and up?

1. Fluid energy mill
2. Jaw crusher
3. Ball mill
4. Rod mill

**Options :**

878270206925. 1

878270206926. 2

878270206927. 3

878270206928. 4

**Question Number : 23 Question Id : 87827052586 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following is a continuous filter?

1. Plate and frame filter press
2. Shell and leaf filter press
3. Cartridge filter
4. Rotary drum filter

**Options :**

878270206929. 1

878270206930. 2

878270206931. 3

878270206932. 4

**Question Number : 24 Question Id : 87827052587 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In a mixing tank operating at very high Reynolds number  $> 10^4$ , if the diameter of the impeller is doubled keeping the other conditions constant, the power required increases by a factor of;

1.  $1/32$
2.  $1/4$
3. 4
4. 32

**Options :**

878270206933. 1

878270206934. 2

878270206935. 3

878270206936. 4

**Question Number : 25 Question Id : 87827052588 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The maximum heat loss from pipe occurs when the critical radius equals;

1. the ratio of the surface coefficient of heat transfer to the thermal conductivity of the insulation
2. the ratio of the thermal conductivity of the insulation to the surface coefficient of heat transfer
3. the product of thermal conductivity of the insulation and the surface coefficient of heat transfer
4. the radius of the pipe

**Options :**

878270206937. 1

878270206938. 2

878270206939. 3

878270206940. 4

**Question Number : 26 Question Id : 87827052589 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

For laminar film condensation, what is the ratio of heat transfer to a horizontal tube of large diameter to that to a vertical tube of the same size for the same temperature difference?

1.  $0.64 (L/D)^{1/2}$
2.  $0.64 (L/D)^{1/3}$
3.  $0.64 (L/D)^{1/4}$
4.  $0.64 (L/D)^{1/5}$

**Options :**

878270206941. 1

878270206942. 2

878270206943. 3

878270206944. 4

**Question Number : 27 Question Id : 87827052590 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Correct Marks : 4 Wrong Marks : 1**

For the same process temperatures, the ratio of the LMTD in parallel flow to the LMTD in counter-current flow in liquid-liquid heat exchanger is always.

1. 1
2.  $< 1$
3. 1-10
4. Infinity

**Options :**

878270206945. 1

878270206946. 2

878270206947. 3

878270206948. 4

**Question Number : 28 Question Id : 87827052591 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A Minimum Instruction Time : 0 Correct Marks : 4 Wrong Marks : 1**

When a longitudinal baffle is placed across the shell, the shell side fluid is forced to pass through the heat exchanger;

1. once
2. twice
3. thrice
4. four times

**Options :**



878270206949. 1

878270206950. 2

878270206951. 3

878270206952. 4

**Question Number : 29 Question Id : 87827052592 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Match list I with list II

| List I                                | List II                                     |
|---------------------------------------|---------------------------------------------|
| (Dimensionless quantity)              | (Application)                               |
| (A) Number of transfer units          | (I). Recuperative type heat exchangers      |
| (B) Periodic flow heat                | (II). Regenerative type heat exchangers     |
| (C) Chemical additive                 | (III). A measure of the heat exchanger size |
| (D) Deposition heat exchanger surface | (IV). Prolongs dropwise condensation        |
|                                       | (V). Fouling factor                         |

Choose the correct answer from the options given below:

1. (A) - (III), (B) - (II), (C) - (V), (D) - (IV)
2. (A) - (II), (B) - (I), (C) - (IV), (D) - (V)
3. (A) - (III), (B) - (II), (C) - (IV), (D) - (V)
4. (A) - (III), (B) - (I), (C) - (II), (D) - (IV)

**Options :**

878270206953. 1

878270206954. 2

878270206955. 3

878270206956. 4

**Question Number : 30 Question Id : 87827052593 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Heat transfer takes place according to;

1. Zeroth law of thermodynamics
2. First law of thermodynamics
3. Second law of thermodynamics
4. Third law of thermodynamics

**Options :**

878270206957. 1

878270206958. 2

878270206959. 3

878270206960. 4

**Question Number : 31 Question Id : 87827052594 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

HETP is numerically equal to HTU only when operating line;

1. lies below the equilibrium line
2. lies above the equilibrium line
3. is parallel to equilibrium line
4. is far from the equilibrium line

**Options :**

878270206961. 1

878270206962. 2

878270206963. 3

878270206964. 4

**Question Number : 32 Question Id : 87827052595 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Flash distillation is used at a large scale in;

1. Sulphuric acid manufacturing
2. Ammonia synthesis
3. Petroleum refining
4. Phenol-formaldehyde resins separation

**Options :**

878270206965. 1

878270206966. 2

878270206967. 3

878270206968. 4

**Question Number : 33 Question Id : 87827052596 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In the absorption of a solute gas from a mixture containing inerts in a solvent, it has been observed that the overall gas transfer coefficient is nearly equal to the individual gas film transfer coefficient. It may therefore be concluded that;

1. the process is liquid film controlled
2. the gas is sparingly soluble in the solvent
3. the transfer rate can be increased substantially by reducing the thickness of the liquid film
4. the transfer rate can be increased substantially by reducing the thickness of the gas film

**Options :**

878270206969. 1

878270206970. 2

878270206971. 3

878270206972. 4

**Question Number : 34 Question Id : 87827052597 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

In small column; local efficiency is .....Murphree efficiency and in large column; local efficiency is .....Murphree efficiency.

1. equal to, less than
2. equal to, more than
3. less than, equal to
4. less than, more than

**Options :**

878270206973. 1
878270206974. 2
878270206975. 3
878270206976. 4

**Question Number : 35 Question Id : 87827052598 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Sugar is leached from sugar beats with

1. cold water
2. hot water
3. sulphuric acid
4. nitric acid

**Options :**

878270206977. 1
878270206978. 2
878270206979. 3
878270206980. 4

**Question Number : 36 Question Id : 87827052599 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Higher holdup of the solid in the rotary drier results in;

- (A). increased kiln action
- (B). decreased kiln action
- (C). poor exposure of the solid to the gas
- (D). an increase in power required for operating the drier

Choose the *correct* answer from the options given below:

- 1. B, C and D only.
- 2. A, B, C and D.
- 3. A, B and D only.
- 4. A, C and D only.

**Options :**

- 878270206981. 1
- 878270206982. 2
- 878270206983. 3
- 878270206984. 4

**Question Number : 37 Question Id : 87827052600 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

The grading of nitrogeous fertilizers is based on;

1.  $\text{NO}_2$  content
2.  $\text{N}_2$  content
3.  $\text{HNO}_3$  content
4.  $\text{N}_2\text{O}_4$  content

**Options :**

878270206985. 1

878270206986. 2

878270206987. 3

878270206988. 4

**Question Number : 38 Question Id : 87827052601 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Bleaching of paper pulp is done by;

1. Bromine
2. Activated clay
3. Chlorine
4. Magnesium sulphate

**Options :**

878270206989. 1

878270206990. 2

878270206991. 3

878270206992. 4

**Question Number : 39 Question Id : 87827052602 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

XLPE is the trade name of

1. low density polyethylene
2. high density polyethylene
3. linear low density polyethylene
4. crosslinked polyethylene

**Options :**

878270206993. 1

878270206994. 2

878270206995. 3

878270206996. 4

**Question Number : 40 Question Id : 87827052603 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Strength of sulphuric acid can be measured by;

- A. electrical conductance
- B. refractive index
- C. electrical transmittance
- D. sonic transmittance

Choose the *correct* answer from the options given below:

1. C and D only.
2. B and D only.
3. A, C and D only.
4. A, B and D only.

**Options :**

878270206997. 1

878270206998. 2

878270206999. 3



878270207000. 4

**Question Number : 41 Question Id : 87827052604 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

An additional step in the manufacture of paper from bagasse as compared to that from bamboo is;

1. depithing
2. digestion
3. bleaching
4. bleaching and digestion

**Options :**

878270207001. 1

878270207002. 2

878270207003. 3

878270207004. 4

**Question Number : 42 Question Id : 87827052605 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

An asset is purchased at a cost of Rs. 5000. It has no salvage value at the end of its life of 10 years. Its book value at the end of 5 years using straight line method will be;

1. Rs. 25,000 - 00
2. Rs. 20,000 - 00
3. Rs. 16,384 - 00
4. Rs. 15,000 - 00

**Options :**

878270207005. 1

878270207006. 2



878270207007. 3

878270207008. 4

**Question Number : 43 Question Id : 87827052606 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

A production equipment costs Rs. 2,00,000-00. It's salvage value is Rs. 20,000-00. The expected return is Rs. 50,000-00 per annum. The corporate taxes are taken as 40%. The pay back period will be:

1. 4 years
2. 6 years
3. 8 years
4. 10 years

**Options :**

878270207009. 1

878270207010. 2

878270207011. 3

878270207012. 4

**Question Number : 44 Question Id : 87827052607 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Capitalized cost comparison method is used for comparing alternatives having;

1. high initial cost
2. high maintenance cost
3. high service life
4. high running cost

**Options :**

878270207013. 1

878270207014. 2

878270207015. 3

878270207016. 4

**Question Number : 45 Question Id : 87827052608 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

A company spends considerable amount on publicity to promote sales. This expenditure in break even chart is shown below the;

1. fixed cost line
2. variable cost line
3. total cost line
4. sales revenue line

**Options :**

878270207017. 1

878270207018. 2

878270207019. 3

878270207020. 4

**Question Number : 46 Question Id : 87827052609 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Routh test **cannot** be used to test the stability of a control system containing;

1. controller
2. transportation lag
3. final control element
4. controller and control element

**Options :**

878270207021. 1

878270207022. 2

878270207023. 3

878270207024. 4

**Question Number : 47 Question Id : 87827052610 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The first order thermometer used has a time constant of 50s. If it is subjected to a sinusoidal input at cycling of 0.002 Hz, then the time lag produced in the instrument will be;

1. 0.0025s
2. 0.01s
3. 0.02s
4. 0.04s

**Options :**

878270207025. 1

878270207026. 2

878270207027. 3

878270207028. 4

**Question Number : 48 Question Id : 87827052611 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Strain gauge rosettes are used when the direction of

1. hoop stress is not known
2. principal stress is not known
3. principal stress is known
4. longitudinal stress is not known

**Options :**

- 878270207029. 1
- 878270207030. 2
- 878270207031. 3
- 878270207032. 4

**Question Number : 49 Question Id : 87827052612 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In a closed loop system, the process to be controlled is an integrating process with transfer function  $1/25$ . The controller proposed to be used is an integral controller with transfer function  $1/T_1 S$ . When a step change in set point is applied to such a closed system, the controlled variable will exhibit

- 1. overdamped response
- 2. underdamped response
- 3. undamped response
- 4. unstable response

**Options :**

- 878270207033. 1
- 878270207034. 2
- 878270207035. 3
- 878270207036. 4

**Question Number : 50 Question Id : 87827052613 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Match List I with List II

| List I                                                                                             | List II                |
|----------------------------------------------------------------------------------------------------|------------------------|
| A. A device whose output is enlarged version of output                                             | I. Calibration         |
| B. The process of making adjustments so that the instrument readings conform to accepted standards | II. Signal             |
| C. Measures and generates an opposing effect to maintain zero deflection                           | III. Amplifier         |
| D. An action to convey information                                                                 | IV. Null type detector |

Choose the correct answer from the options given below:

1. A - III, B - I, C - IV, D - II
2. A - II, B - I, C - IV, D - III
3. A - III, B - IV, C - I, D - II
4. A - III, B - II, C - IV, D - I

**Options :**

878270207037. 1

878270207038. 2

878270207039. 3

878270207040. 4

**Question Number : 51 Question Id : 87827052614 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In the McCabe-Thiele diagram for binary distillation, vertical feed line represents.....feed and horizontal feed line represents.....feed.

- A. Saturated vapour
- B. Saturated liquid
- C. Superheated vapour
- D. Subcooled liquid

Choose the *correct* answer from the options given below:

- 1. A and B Only
- 2. A and C Only
- 3. B and D Only
- 4. A and D Only

**Options :**

- 878270207041. 1
- 878270207042. 2
- 878270207043. 3
- 878270207044. 4

**Question Number : 52 Question Id : 87827052615 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

When damping coefficient is equal to 1 for a second order system, then

- A. both the roots will be equal
- B. both the roots will be real
- C. both the roots will be complex
- D. both the roots will be unequal

Choose the *correct* answer from the options given below:

- 1. A and B Only
- 2. B and C Only
- 3. C and D Only
- 4. A and D Only

**Options :**

878270207045. 1

878270207046. 2

878270207047. 3

878270207048. 4

**Question Number : 53 Question Id : 87827052616 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Routh test criterion

- A. is applicable only to those systems with polynomial characterizatic equation
- B. does not prove any information about the actual location of roots
- C. is applicable only to those systems with non-polynomial characterizatic equation
- D. Gives full information about the actual location of roots

Choose the *correct* answer from the options given below:

- 1. A and B Only
- 2. C and D Only
- 3. B and C Only
- 4. A and D Only

**Options :**

- 878270207049. 1
- 878270207050. 2
- 878270207051. 3
- 878270207052. 4

**Question Number : 54 Question Id : 87827052617 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**



The approach of thermodynamics temperature scale is based on;

- A. heat engine operating according to Carnot cycle
- B. behaviour of a perfect gas
- C. behaviour of an ideal liquid
- D. principle of reversed heat engine

Choose the *correct* answer from the options given below:

- 1. A and D Only
- 2. A and C Only
- 3. A and B Only
- 4. B and D Only

**Options :**

878270207053. 1

878270207054. 2

878270207055. 3

878270207056. 4

**Question Number : 55 Question Id : 87827052618 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

In a flow-nozzle type flow meter, the contraction is noticed to be;

- A. gradual
- B. abrupt
- C. no change
- D. discrete

Choose the *correct* answer from the options given below:

- 1. A, B
- 2. C
- 3. D
- 4. C, D

**Options :**

- 878270207057. 1
- 878270207058. 2
- 878270207059. 3
- 878270207060. 4

**Question Number : 56 Question Id : 87827052619 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

The lower limit of useful working range of a transducer is determined by it's

- A. error
- B. noise
- C. accuracy
- D. stability

Choose the *correct* answer from the options given below:

- 1. A and B only
- 2. A and C only
- 3. B and C only
- 4. B and D only

**Options :**

- 878270207061. 1
- 878270207062. 2
- 878270207063. 3
- 878270207064. 4

**Question Number : 57 Question Id : 87827052620 Question Type : MCQ Option Shuffling : No  
Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A  
Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Microprocessor based systems which are increasingly being used for dedicated applications in process instrumentation are;

- 1. intelligent instrumentation systems
- 2. dumb instrumentation systems
- 3. control instrumentation systems
- 4. robust instrumentation systems

**Options :**

- 878270207065. 1
- 878270207066. 2

878270207067. 3

878270207068. 4

**Question Number : 58 Question Id : 87827052621 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Dynamic response of a system consists of ;

- A. steady state response only
- B. transient state response only
- C. unsteady state response only
- D. non-transient state response only

Choose the *correct* answer from the options given below:

- 1. A and B only
- 2. A and D Only
- 3. C and D Only
- 4. B and C Only

**Options :**

878270207069. 1

878270207070. 2

878270207071. 3

878270207072. 4

**Question Number : 59 Question Id : 87827052622 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Tubeless tyre can be made from

1. SBR
2. Butyl rubber
3. Silicone rubber
4. Nitrile rubber

**Options :**

878270207073. 1

878270207074. 2

878270207075. 3

878270207076. 4

**Question Number : 60 Question Id : 87827052623 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Effect of smoke in the preparation of smoked rubber sheet is;

- A. to make the rubber brown
- B. to serve as a preservator
- C. to make the rubber soft
- D. to make the rubber blistering

Choose the *correct* answer from the options given below:

1. A and B Only
2. A and C Only
3. B and D Only
4. A and D Only

**Options :**

878270207077. 1

878270207078. 2

878270207079. 3

**Question Number : 61 Question Id : 87827052624 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The characteristic that deteriorates when more amount of styrene is added in butadiene to get SBR during polymerization is;

1. resilience
2. strength
3. elongation
4. freezing point

**Options :**

878270207081. 1

878270207082. 2

878270207083. 3

878270207084. 4

**Question Number : 62 Question Id : 87827052625 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Bicycle paddle is an example of

1. blow moulding
2. injection moulding
3. thermoforming
4. compression moulding

**Options :**

878270207085. 1

878270207086. 2

878270207087. 3

878270207088. 4

**Question Number : 63 Question Id : 87827052626 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

In extrusion, the primary function of transition zone is to;

- A. compress the polymer
- B. melt the polymer
- C. support the screen pack
- D. contribute for the back pressure

Choose the *correct* answer from the options given below:

- 1. A and B only
- 2. A and C only
- 3. B and D only
- 4. A and D only

**Options :**

878270207089. 1

878270207090. 2

878270207091. 3

878270207092. 4

**Question Number : 64 Question Id : 87827052627 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Diglycidyl ether of bisphenol - A and 4, 4'-diamino diphenyl sulfone system can be used to obtain glass reinforced composites by the process of

1. wet-lay-up technique
2. dry-lay-up technique
3. dry-wet-up technique
4. wet-dry-up-technique

**Options :**

878270207093. 1

878270207094. 2

878270207095. 3

878270207096. 4

**Question Number : 65 Question Id : 87827052628 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Self polymerization of reactive styrene at room temperature can be prevented by the addition of

1. dicumyl peroxide
2. p-tetra butyl catechol
3. diazo carbonamide
4. chromium oxide

**Options :**

878270207097. 1

878270207098. 2

878270207099. 3

878270207100. 4

**Question Number : 66 Question Id : 87827052629 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**



**Correct Marks : 4 Wrong Marks : 1**

Polymer having high tensile strength, tensile modulus, stiffness, melting point and heat distortion temperature combined with low specific gravity and excellent resistance to environmental stress cracking is

1. LDPE
2. Polypropylene
3. HDPE
4. Styrene-butadiene rubber

**Options :**

878270207101. 1

878270207102. 2

878270207103. 3

878270207104. 4

**Question Number : 67 Question Id : 87827052630 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The polymer ---A--A--A--B--B---AAA---B----B represents

1. block copolymer
2. graft copolymer
3. random copolymer
4. alternate copolymer

**Options :**

878270207105. 1

878270207106. 2

878270207107. 3

878270207108. 4

**Question Number : 68 Question Id : 87827052631 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The kinetics and degree of polymerization of polymer during emulsion polymerization depends upon

1. time of process, quality of initiator
2. quantity of initiator, intensity of agitator
3. intensity of agitator, temperature of process
4. temperature and time of process, quantity of initiator and intensity of agitator

**Options :**

878270207109. 1

878270207110. 2

878270207111. 3

878270207112. 4

**Question Number : 69 Question Id : 87827052632 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

For the manufacture of Nylon-6 by condensation polymerization of caprolactum, the temperature maintained in the reactor is about

1. 60-80°C
2. 130-140°C
3. 240-280°C
4. 400-450°C

**Options :**

878270207113. 1

878270207114. 2

878270207115. 3

878270207116. 4

**Question Number : 70 Question Id : 87827052633 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Catalyst used during the condensation of phenol and formaldehyde in order to get the highest electrical properties is

1. Liquid ammonia
2. Caustic soda solution
3. Sulphuric acid
4. Hydrochloric acid

**Options :**

878270207117. 1

878270207118. 2

878270207119. 3

878270207120. 4

**Question Number : 71 Question Id : 87827052634 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

If the function  $f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$  is analytic, then the values of  $a, b, c$  and  $d$  are given by

1.  $a = 2, b = -1, c = 1, d = -2$
2.  $a = 2, b = 1, c = -1, d = 2$
3.  $a = 2, b = 1, c = 1, d = 2$
4.  $a = 2, b = -1, c = -1, d = 2$

**Options :**

878270207121. 1

878270207122. 2

878270207123. 3

878270207124. 4

**Question Number : 72 Question Id : 87827052635 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

Which of the following is **not** correct?

1. If  $A$  and  $B$  are two matrices of order  $2 \times 3$  and  $3 \times 4$  respectively, then their product  $AB$  is of order  $2 \times 4$ .
2. If  $A$  and  $B$  are square matrices of same order, then  $AB = BA$ .
3. The augmented matrix of the system of linear equations in matrix form  $AX = B$  is given by  $(A|B)$ .
4. Any homogeneous system of linear equations has at least one solution.

**Options :**

878270207125. 1  
878270207126. 2  
878270207127. 3  
878270207128. 4

**Question Number : 73 Question Id : 87827052636 Question Type : MCQ Option Shuffling : No**  
**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**  
**Minimum Instruction Time : 0**  
**Correct Marks : 4 Wrong Marks : 1**

The first order partial derivative of the function  $\log(\sin x + \cos y)$  with respect to the variables  $x$  and  $y$ , respectively, are given by

1.  $\frac{\cos x}{\sin x + \cos y}, \frac{-\sin y}{\sin x + \cos y}$
2.  $\frac{\sin x}{\sin x + \cos y}, \frac{\cos y}{\sin x + \cos y}$
3.  $\frac{-\cos x}{\sin x + \cos y}, \frac{\sin y}{\sin x + \cos y}$
4.  $\frac{-\cos x}{\sin x + \cos y}, \frac{-\sin y}{\sin x + \cos y}$

**Options :**

878270207129. 1  
878270207130. 2  
878270207131. 3

**Question Number : 74 Question Id : 87827052637 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

The complementary function of the differential equation  $\frac{d^2y}{dx^2} + 16y = x \sin \mu x, \mu \neq \pm 4$  is given by

1.  $\alpha \cos 16x + \beta \sin 16x$ , where  $\alpha$  and  $\beta$  are constants.
2.  $\alpha \cos 4x + \beta \sin 4x$ , where  $\alpha$  and  $\beta$  are constants.
3.  $\alpha \cos 8x + \beta \sin 8x$ , where  $\alpha$  and  $\beta$  are constants.
4.  $\alpha \cos 2x + \beta \sin 2x$ , where  $\alpha$  and  $\beta$  are constants.

**Options :**

878270207133. 1

878270207134. 2

878270207135. 3

878270207136. 4

**Question Number : 75 Question Id : 87827052638 Question Type : MCQ Option Shuffling : No**

**Is Question Mandatory : No Calculator : Scientific Response Time : N.A Think Time : N.A**

**Minimum Instruction Time : 0**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following is correct

1. The Cauchy-Riemann equations are given by  $\frac{\partial u}{\partial x} = \frac{\partial v}{\partial x}$  and  $\frac{\partial u}{\partial y} = -\frac{\partial v}{\partial y}$ .
2. The function  $f(z) = \bar{z}$  is analytic everywhere.
3. If  $f(z)$  is analytic inside and on a simple closed curve  $C$  and  $a$  is any point inside  $C$ , then  $f(a)$  is given by  $\oint_C \frac{f(z)}{z-a} dz$ .
4. If  $f(z)$  is analytic inside and on a simple closed curve  $C$  except at a finite number of points  $a, b, c, \dots$  inside  $C$  at which the residues are  $a_{-1}, b_{-1}, c_{-1}, \dots$  respectively, then  $\oint_C f(z) dz = 2\pi i(a_{-1} + b_{-1} + c_{-1} + \dots)$

**Options :**

878270207137. 1

878270207138. 2

878270207139. 3

878270207140. 4

