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JKSSB JE

**Previous Year Paper
(Mechanical)
01 Oct, 2023**



1. 10. 2023

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Booklet Serial No. 012881

Test Booklet Series

QUESTION BOOKLET FOR THE EXAMINATION TO THE POST OF
JUNIOR ENGINEER MECHANICAL
OMR Examination - 2023

A

Time Allowed: 2 Hours

Maximum Marks: 120

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET **DOES NOT** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
 2. Please note that it is the candidate's responsibility to encode and fill in the Roll Number and Test Booklet Series Code A, B, C or D carefully and without any omission or discrepancy at the appropriate places in the OMR Answer /Response Sheet. Any omission/discrepancy will render the Response Sheet liable for rejection.
 3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside.
DO NOT write anything else on the Test Booklet.
- | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|
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4. This Test booklet contains 120 items (questions). Each item comprises of four responses (answers). You will select the response which you want to mark on the Answer Sheet/Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the appropriate. In any case, choose **ONLY ONE** response for each item.
 5. You have to mark all your responses **ONLY** on the separate Answer /Response Sheet provided. See directions in the Response Sheet.
 6. All items carry equal marks.
 7. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator **only the Answer /Response Sheet**. You are permitted to take away with you the Test Booklet and **Candidate's Copy of the Response Sheet**.
 8. Sheets for rough work are appended in the Test Booklet at the end.
 9. While writing Centre Code and Roll No. on the top of the Answer Sheet/Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.
 10. **Penalty for wrong answers:**
THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY THE CANDIDATE IN THE WRITTEN TEST (OBJECTIVE TYPE QUESTIONS PAPERS).
 - (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, ($\frac{1}{4}$) of the marks assigned to that question will be deducted as penalty.
 - (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above for that question.
 - (iii) If a question is left blank, i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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(Set - A)01-Oct-2023

1. 10. 2023

012881



INSTRUCTIONS

1. The student must read the instructions carefully before attempting the test.
2. The test is of 1 hour duration.
3. The student must write the answers in the provided space.
4. The student must not use any electronic device during the test.
5. The student must not discuss the test with anyone else.

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6. The student must not write anything on the back of the paper.
7. The student must not use any pen or pencil during the test.
8. The student must not use any eraser during the test.
9. The student must not use any ruler during the test.
10. The student must not use any calculator during the test.

11. The student must not use any mobile phone during the test.
12. The student must not use any watch during the test.
13. The student must not use any bag during the test.
14. The student must not use any bag during the test.

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26. The student must not use any bag during the test.

1. If a spur gear has 30 teeth and is rotating at 200 rpm with a module of 2 mm, what would be its pitch line velocity in mm/s?
 - A) 501 mm/s
 - B) 983.2 mm/s
 - C) 1264 mm/s
 - D) 628.3 mm/s
2. The rotational speed of an automobile engine fluctuates between 210 rad/sec and 190 rad/sec. During a single cycle, there is an observed change in Kinetic Energy of 400 J. What is the mass inertia of the flywheel about its central axis, represented in kg-m²?
 - A) 0.15
 - B) 0.10
 - C) 0.25
 - D) 0.05
3. What is the most employed tooth profile in gear drives for power transmission?
 - A) A cycloid
 - B) An involute
 - C) A hyperbola
 - D) A spiral
4. Match List-I with List-II and select the correct answer using the correct answer using the codes given below:

List - I

- a. Spur Gears
- b. Helical Gears
- c. Worm Gears
- d. Bevel Gears

List - II

1. Transmit motion between non-parallel and non-intersecting shafts.
2. Transmit motion between parallel shafts.
3. Transmit motion between intersecting shafts.
4. Transmit motion between parallel shafts or non-parallel shafts

Codes:

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

(Set - A)

(3)

[P.T.O.]

5. Match List-I with List-II and select the correct answer using the correct answer using the codes given below:

List – I

- a. Quick return
- b. Apron
- c. Indexing
- d. Regulating

List - II

- 1. Lathe machine
- 2. Milling Machine
- 3. Shaper mechanism
- 4. Center less wheel grinding

Codes:

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

6. Misruns and cold shuts in sand casting arise from:

- A) Elevated pouring temperature
- B) Lower pouring temperature
- C) Defective mold flask
- D) Diminished strength of solidified metal

7. Assertion-Reasoning:

Assertion (A): Plastic deformation in metals and alloys is a permanent deformation under load. It is useful in strengthening the products obtained via cold rolling process.

Reason (R): Plastic or permanent deformation in metal/alloys causes an increase in dislocation density.

- A) Both A and R are individually true, and R is the correct explanation of A.
- B) Both A and R are individually true, but R is NOT the correct explanation of A
- C) A is true but R is false.
- D) A is false but R is true.

(Set - A)

(4)

8. The volume of a cube with side 'i' and the volume of a sphere with radius 'r' are equal. Both the cube and sphere are composed of the same material and are being cast. What is the ratio of the solidification time of the cube to that of the sphere?

A) $\left(\frac{4\pi}{6}\right)^3 \left(\frac{r}{i}\right)^6$

B) $\left(\frac{4\pi}{6}\right) \left(\frac{r}{i}\right)^2$

C) $\left(\frac{4\pi}{6}\right)^2 \left(\frac{r}{i}\right)^3$

D) $\left(\frac{4\pi}{6}\right)^2 \left(\frac{r}{i}\right)^4$

9. In machining, width of cut becomes equal to depth of cut when the principal cutting edge angle is equal to:

A) 60°

B) 90°

C) 30°

D) 0°

10. Of what material are optical flats typically made?

A) Quartz

B) Glass

C) Plastic

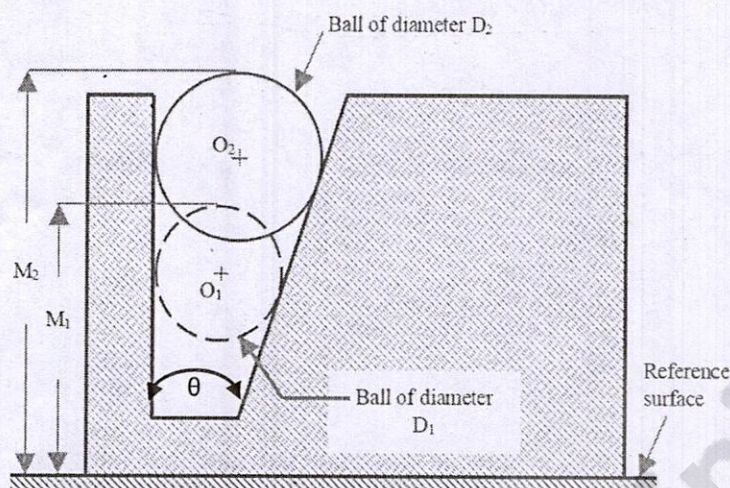
D) Steel

(Set - A)

(5)

[P.T.O.]

11. Two pairs of cylindrical pins have been used to measure the taper of a profile gauge. Each pair is having diameter of $D_1 = 30$ mm and $D_2 = 50$ mm. The dimensions $M_1 = 55$ mm and $M_2 = 100$ mm are measured using a height gauge (as shown in the figure). The value of taper angle θ is close to:



- A) 32 degrees
 B) 48 degrees
 C) 25 degrees
 D) 56 degrees
12. The least count of a vernier caliper is defined as:
- A) Ratio of a main scale division and a vernier scale division
 B) Difference between main scale division and vernier scale division
 C) Product of main scale division and vernier scale division
 D) Sum of main scale division and vernier scale division
13. A 4-stroke 4-cylinder reciprocating engine has a cylinder diameter of 4 cm, stroke length of 7 cm and clearance volume of 2 cm^3 . The engine capacity in cc is:
- A) 110
 B) 252
 C) 400
 D) 352

(Set - A)

(6)

14. Water in a bucket is whirled in a vertical circle with a string attached to it. The water does NOT fall even when the bucket is inverted at the top of its path. This is due to:

- A) $mg = \frac{mv^2}{r}$
- B) mg is greater than $\frac{mv^2}{r}$
- C) mg is NOT greater than $\frac{mv^2}{r}$
- D) mg is NOT less than $\frac{mv^2}{r}$

15. To stop a car in shortest distance on a horizontal road, one should:

- A) Apply the brakes very hard so that the wheels stop rotating.
- B) Apply the brakes hard enough to just prevent slipping.
- C) Shut the engine off and NOT apply brakes.
- D) None of the above

16. How is the modulus of rigidity defined?

- A) The ratio of linear stress to linear strain within elastic limit
- B) The ratio of shear stress to shear strain within elastic limit.
- C) The ratio of identical stresses acting in three mutually perpendicular directions on a body to the corresponding volumetric strain
- D) The ratio of linear stress to lateral strain within elastic limit

17. Among the following factors, which one does NOT influence the buckling load:

- A) Modulus of elasticity
- B) Slenderness ratio
- C) Cross-sectional area
- D) Area moment of inertia

18. For the velocity profile, $\frac{u}{U_\infty} = \left\{ \frac{y}{\delta} \right\}^{1/5}$ the momentum boundary layer thickness (in mm)

when $\delta = 1 \text{ mm}$, is

A) $\frac{42}{5}$

B) $\frac{5}{42}$

C) $\frac{13}{5}$

D) $\frac{5}{13}$

19. The difference in pressure (in N/m^2) across an air bubble of diameter 0.002 m immersed in water (surface tension $= 0.072 \text{ N/m}$) is

A) 288

B) 144

C) 576

D) 244

20. Weber's number is defined as:

A) Square root of ratio of surface tension force to pressure force

B) Square root of ratio of inertia force to pressure force

C) Square root of ratio of inertia force to surface tension force.

D) Square root of ratio of surface tension force to inertia force

21. Consider a laminar flow over a flat plate of length $L=1 \text{ m}$. The boundary layer thickness at the end of the plate is δ_w for water, and δ_a for air for the same freestream velocity. If the kinematic viscosities of water and air are $1 \times 10^{-6} \text{ m}^2/\text{s}$ and $1.6 \times 10^{-5} \text{ m}^2/\text{s}$, respectively,

the ratio of $\frac{\delta_w}{\delta_a}$ is:

A) $1/4$

B) 4

C) 2

D) $1/2$

(Set - A)

(8)

22. The _____ of thermodynamics states that, *it is impossible to construct a device which, operating in a cycle, will produce no effect other than the transfer of heat from a cooler to a hotter body.*
- First law
 - Zeroth law
 - Second law (Clausius statement)
 - Second law (Kelvin-Plank statement)
23. A perfect engine works on the Carnot cycle between 727°C and 127°C . The efficiency of the engine is:
- 40%
 - 70%
 - 60%
 - 50%
24. The air standard efficiency of the Otto cycle is:
- $\eta = 1 - r^{\gamma-1}$
 - $\eta = 1 - r^{\frac{\gamma-1}{\gamma}}$
 - $\eta = 1 - \frac{1}{r^{\frac{\gamma-1}{\gamma}}}$
 - $\eta = 1 - \frac{1}{r^{\gamma-1}}$
25. A diesel engine has a compression ratio of 16 and cut-off takes place at 6% of the stroke. What will be the cut-off ratio?
- 1.6
 - 1.9
 - 2.1
 - 2.4

(Set - A)

(9)

[P.T.O.]

26. Latent heat of _____ is the heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
- A) Vaporization
 - B) Fusion
 - C) Fission
 - D) Condensation
27. Arrange the following steps in order to eliminate waste and enhance efficiency in lean manufacturing.
- a. Seiso
 - b. Shitsuke
 - c. Seiri
 - d. Seiketsu
 - e. Seiton
- A) b, c, e, d, a
 - B) c, a, d, b, e
 - C) e, d, b, c, a
 - D) c, e, a, d, b
28. In statistical quality control, the expected process variation (natural tolerance) is commonly taken to be:
- A) $\mu \pm \sigma$
 - B) $\mu \pm 2\sigma$
 - C) $\mu \pm 3\sigma$
 - D) None of the above
29. By which of the following command one can draw a rectangle in AutoCAD?
- A) CO
 - B) ARC
 - C) POL
 - D) REC
30. In modern CNC machine tools, the backlash has been eliminated by
- A) Preloaded ball screws
 - B) Slider crank mechanism
 - C) Rack and pinion
 - D) Ratchet and pinion

(Set - A)

(10)

31. There are five jobs (namely A, B, C, D and E), each of which must go through machines M1 and M2 in the order M1 – M2. Processing Time (in hours) are given below:

Jobs	Processing Time	
	Machine 1 (M1)	Machine 2 (M2)
A	5	2
B	1	6
C	9	7
D	3	8
E	10	4

Determine the sequence of processing the jobs such that the total elapsed time is minimum to process all the jobs through two machines M1 and M2.

- A) B – D – C – E – A
 B) B – C – A – E – D
 C) A – B – D – E – C
 D) B – A – D – C – E
32. The velocity ratio of the belt drive is defined as
 A) The ratio of the speed of the driven pulley to the speed of the driving pulley
 B) The ratio of the speed of the driving pulley to the speed of the driven pulley
 C) The ratio of the diameter of driving pulley to the diameter of the driven pulley
 D) The ratio of RPM of driven pulley to the RPM of the driving pulley.
33. Match the following gear types against its applications
- | | |
|------------------|--|
| a. Spur gears | 1. For non- parallel and non-intersecting axes shafts |
| b. Helical gears | 2. For parallel axes shafts |
| c. Spiral gears | 3. For both parallel and non-parallel and non-intersecting axes shafts |
| d. Bevel gears | 4. For intersecting axes shafts |
- A) a-4, b-3, c-1, d-2
 B) a-2, b-3, c-1, d-4
 C) a-3, b-1, c-4, d-2
 D) a-4, b-2, c-1, d-3
34. In case of square key, the compressive stress induced due to transmitted torque is
 A) Is equal to four times the shear stress
 B) Is equal to thrice the shear stress
 C) Is equal to twice the shear stress
 D) None of the above

35. Which of the following is correct
- A) Coupling and clutch are the same
 - B) Shafts connected by coupling have non-collinear axes
 - C) Coupling can connect or disconnect two shafts
 - D) Clutch can connect or disconnect two shafts
36. A mass of 1 kg is attached to the end of a spring with a stiffness 0.7 N/mm. The critical damping coefficient of this system will be
- A) 1.40 Ns/m
 - B) 18.522Ns/m
 - C) 52.92Ns/m
 - D) 529.2Ns/m
37. Mohr's circle model is used to compute
- A) State of temperature at any point
 - B) State of stress at a point
 - C) State of material property at any point
 - D) None of the above
38. Which of the following is correct
- A) Longitudinal strain = Poisson ratio x Lateral strain
 - B) Poisson ratio = Longitudinal strain x Lateral strain
 - C) Lateral strain = Poisson ratio x Longitudinal strain
 - D) Poisson ratio = Longitudinal strain / Lateral strain
39. The cross-sectional area of a rectangular bar is 10000mm^2 and it is subjected to an axial load of 20kN. What is the normal stress on a section inclined at an angle of 30° with normal cross-section of the bar?
- A) 1.5 N/mm^2
 - B) 0.866 N/mm^2
 - C) 2.5 N/mm^2
 - D) 0.966 N/mm^2

40. In an adiabatic process, which of the following is not true?
- A) No heat enters or leaves the gas
 - B) The temperature of the gas changes
 - C) The change in internal energy is equal to the mechanical workdone
 - D) Heat enters or leaves the gas
41. If the value of $n = 0$ in the equation $p v^n = C$, then the process is called
- A) Constant volume process
 - B) Adiabatic process
 - C) Constant pressure process
 - D) Isothermal process
42. A good refrigerant must have _____ specific heat when it is in liquid state and _____ specific heat when it is vaporized
- A) Low, high
 - B) Low, low
 - C) High, low
 - D) High, high
43. The mass of water vapour present in the unit volume of dry air is
- A) Specific humidity
 - B) Absolute humidity
 - C) Degree of saturation
 - D) Relative humidity
44. Helmholtz function is
- A) $g = h - T s$
 - B) $a = u - T s$
 - C) $du = T ds - P dv$
 - D) $dh = T ds + v dP$
45. For a flow over a flat plate,
- A) The boundary layer thickness (δ) is greater than the length of the flat plate
 - B) The boundary layer thickness (δ) is much smaller than the length of the flat plate
 - C) The boundary layer thickness (δ) is equal to the length of the flat plate
 - D) None of the above

(Set - A)

(13)

[P.T.O.]

46. If the flow is irrotation which of the following need to be satisfied.
- A) $\nabla \cdot \vec{V} = 0$
 - B) $\nabla \times \vec{V} = 0$
 - C) $\nabla \cdot \nabla \vec{V} = 0$
 - D) None of the above
47. What will be the velocity distribution or profile when a fluid is filled between two parallel plates (top and bottom) in which the top plate is moving with a constant velocity V and the bottom plate is fixed.
- A) There is uniform distribution of the fluid
 - B) Velocity distribution is zero
 - C) Velocity distribution is linear
 - D) Velocity distribution is parabolic
48. When a material is able to resist fracture due to high impact load is called
- A) Toughness
 - B) Stiffness
 - C) Plasticity
 - D) Hardness
49. In single V-butts welds, the angle between edges is
- A) 40° to 50°
 - B) 50° to 60°
 - C) 60° to 70°
 - D) 70° to 90°
50. In diamond, the nature of the atomic bond
- A) Metallic
 - B) Covalent
 - C) Ionic
 - D) None of the above

(Set - A)

(14)

51. The pattern used in investment casting is
- A) Wood
 - B) Metal
 - C) Clay
 - D) Wax
52. While using the disposable pattern, the metal should be poured
- A) At any rate
 - B) At the same rate as for other casting process
 - C) Very slowly
 - D) Very rapidly
53. The dimension of bore 14.67mm in a workpiece is measured using
- A) Micrometer
 - B) Pneumatic gauge
 - C) Steel rule
 - D) Plug gauge
54. Autocollimator is used for
- A) Angular measurement
 - B) Straightness measurement
 - C) Parallelism measurement
 - D) Flatness measurement
55. Which of the following is not correct with respect to two stroke engine
- A) A two stroke engine is easily reversed
 - B) A two stroke engine occupies less space
 - C) Frictional losses are less
 - D) Two stroke engine has high maintenance cost

56. The thermal efficiency of petrol engines is
- A) Higher due to higher compression ratio
 - B) Lower due to lower compression ratio
 - C) Lower due to higher compression ratio
 - D) Higher due to lower compression ratio
57. The word automation leads to
- A) Increase in production
 - B) Machine controlled by workers
 - C) Assisting and replacing humans by machines
 - D) All of these
58. In a static environment, forecasting future is
- A) Short term forecasting
 - B) Long term forecasting
 - C) Active forecasting
 - D) Passive forecasting
59. Time taken for the job from its arrival to the system until its departure is
- A) Completion time
 - B) Flow time
 - C) Due time
 - D) Processing time
60. The C items representing the ABC analysis are those which represents
- A) Small percentage of the total annual consumption value
 - B) High percentage of closing inventory value
 - C) High percentage of the total annual consumption value
 - D) Small percentage of closing inventory value

61. When the ordering cost is increased to 4 times, the economic order quantity(EOQ) will be increased to

- A) 8 times
- B) 3 times
- C) 2 times
- D) Remains the same.

62. Consider the following statements:

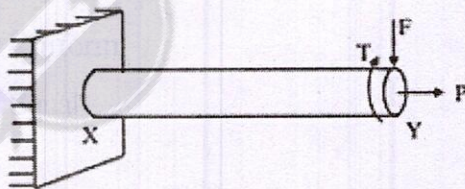
The form factor of a spur gear tooth depends upon the

- 1. Number of teeth
- 2. Pressure angle
- 3. Addendum modification coefficient
- 4. Circular pitch.

Of these statements

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

63. A machine element XY, fixed at end X, is subjected to an axial load P, transverse load F, and a twisting moment T at its free end Y. The most critical point from the strength point of view is



- A) A point on the circumference at location Y
- B) A point at the center at location Y
- C) A point on the circumference at location X
- D) A point at the center at location X

(Set - A)

(17)

[P.T.O.]

71. Heat and work are
- Intensive properties
 - Extensive properties
 - Point functions
 - Path functions
72. In a Rankine cycle, the enthalpies at turbine entry and outlet are 3159 kJ/kg and 2187 kJ/kg, respectively. If the specific pump work is 2 kJ/kg the specific steam consumption (in kg/kWh) of the cycle based on net output is
- 3.71
 - 4.2
 - 5
 - 6.1
73. Consider the following statement regarding refrigerants:
- Refrigerant NH_3 is used in reciprocating compressors
 - Refrigerant CO_2 is used in reciprocating compressors
 - Refrigerant R-11 is used in centrifugal compressors
- Which of this statement is/are correct?
- 1 and 2
 - 1 and 3
 - 2 and 4
 - 1, 2 and 3
74. Match List-I (Process) with List-II (characteristics) and select the correct answer using the code given below
- | List-I | List-II |
|-----------------------|-------------------------------|
| P. Throttling process | I. No work done |
| Q. Isentropic process | II. No change in entropy |
| R. Free expansion | III. Constant internal energy |
| S. Isothermal process | IV. Constant enthalpy |
- P-III, Q-I, R-IV, S-II
 - P-III, Q-II, R-IV, S-I
 - P-IV, Q-II, R-I, S-III
 - P-IV, Q-I, R-II, S-III
75. According to Bernoulli's equation for steady ideal fluid flow
- Principle of conservation mass holds
 - Velocity and pressure are inversely proportional
 - The energy is constant along the streamline but may vary across stream lines
 - None of these

(Set - A)

(20)

76. The total pressure on a horizontally immersed surface (of surface area A) with its centre of gravity at a depth \bar{x} from liquid surface in a liquid of specific weight ω is

- A) ωA
- B) $\omega \bar{x}$
- C) $\frac{\omega A}{\bar{x}}$
- D) $\omega A \bar{x}$

77. Match List-I with List-II and select the correct answer using the codes given below

List-I

- P. Propeller
- Q. Francis turbine
- R. Kaplan turbine
- S. Pelton turbine
- A) P-2, Q-4, R-1, S-3
- B) P-3, Q-4, R-1, S-2
- C) P-2, Q-1, R-4, S-3
- D) P-3, Q-1, R-4, S-2

List-II

- 1. Inward flow reaction
- 2. Tangential flow impulse
- 3. Axial flow reaction with fixed vanes
- 4. Axial flow reaction with adjustable vanes

78. Consider the following assumptions:

- 1. The fluid is compressible.
- 2. The fluid is inviscid.
- 3. The fluid is incompressible and homogeneous.
- 4. The fluid is viscous and compressible.

The Euler's equation of motion requires assumptions indicated in

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

79. The crystal structure of austenite is

- A) BCC
- B) Face Centred Cubic
- C) Hexagonal Closed Packed
- D) Body Centred Tetragonal

(Set - A)

(21)

[P.T.O.]

80. Match the casting defects (Group A) with the probable causes (Group B)

- | Group A | Group B |
|----------------|--|
| 1. Cold Shut | P. Wide range of solidification temperature |
| 2. Shrinkage | Q. Low permeability of the sand mould |
| 3. Blow holes | R. Volumetric contraction both in liquid and solid stage |
| 4. Hot tears | S. Improper fusion of two streams of liquid metal |
- A) 4-S, 3-Q, 2-R, 1-P,
B) 1-S, 3-Q, 2-R, 4-P,
C) 3-S, 1-Q, 2-R, 4-P,
D) 4-S, 2-Q, 1-R, 3-P,

81. Match the following products with preferred manufacturing processes:

- | Group A (Products) | Group B (Manufacturing Processes) |
|---------------------------|--|
| I. Rails | P. Blow molding |
| II. Engine crankshaft | Q. Extrusion |
| III. Aluminium channels | R. Forging |
| IV. PET water bottles | S. Rolling |
- A) I-S, II-R, III-Q, IV-P
B) I-S, II-R, III-P, IV-Q
C) I-Q, II-S, III-R, IV-P
D) I-R, II-S, III-Q, IV-P

82. Consider the following statements.

- P) Electrolyte is used in Electro-chemical machining.
Q) Electrolyte is used in Electrical discharge machining.
R) Abrasive-slurry is used in Ultrasonic machining.
S) Abrasive-slurry is used in Abrasive jet machining. Among the above statements, the correct ones are
- A) P and R only
B) Q and S only
C) Q, R and S only
D) P and Q only

83. A gating ratio 1 : 2 : 4 is used to design the gating system for magnesium alloy casting. This gating system refer to the cross-section areas of the various gating elements as given below:

1. Down sprue
2. Runner bar
3. Ingate

The correct sequence of the above elements in the ration 1 : 2: 4 is

- A) 1 , 2 and 3
B) 1, 3 and 2
C) 2, 3 and 1
D) 3, 1 and 2

(Set - A)

(22)

84. Match the correct pairs between List-I and List-II

Measuring Instruments		Applications	
P.	Talysurf	1.	T-slot
Q.	Telescopic gauge	2.	Flatness
R.	Transfer callipers	3.	Internal diameter
S.	Autocollimator	4.	Roughness
A)	P – 2, Q – 3, R – 4, S – 1		
B)	P – 4, Q – 3, R – 1, S – 2		
C)	P – 2, Q – 3, R – 1, S – 4		
D)	P – 3, Q – 2, R – 1, S – 4		

85. The component that is responsible for converting the rotation of the steering wheel into lateral motion is the

- A) Steering wheel
- B) Steering shaft
- C) Steering gearbox
- D) Tie rod

86. In a Morse test for a 2-cylinder, 2-stroke, spark ignition engine, the brake power was 9 kW whereas the brake powers of individual cylinders with spark cut off were 4.25 kW and 3.75 kW respectively. The mechanical efficiency of the engine is

- A) 90%
- B) 80%
- C) 45.5%
- D) 52.5%

87. Knocking in a spark ignition engine can be reduced by

- 1. Retarding the spark
- 2. Supercharging
- 3. Increasing the engine speed
- 4. Using a fuel of long straight chain structure

Select the correct answer using the codes given below

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

(Set - A)

(23)

[P.T.O.]

88. NC contouring is an example of following positioning

- A) Continuous path
- B) Point -to- path
- C) Absolute
- D) Incremental

89. Consider the following statements.

- P. Computer aided process planning (CAPP) takes input from material requirement plan (MRP).
- Q. Production flow analysis helps in work cell formation.
- R. Group technology takes input from choice of machining or cutting parameters.

Among the above statements, the correct one(s) is (are)

- A) P only
- B) Q and R only
- C) P and R only
- D) Q only

90. Match the geometric tolerances with their correct symbols:

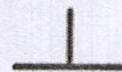
P. Perpendicularity

1.



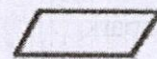
Q. Flatness

2.



R. Concentricity

3.



S. Roundness (Circularity)

4.



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

(Set - A)

(24)

91. Statistical quality control was developed by
- A) Frederick Tylor
 - B) Walter A. Shewhart
 - C) George Dantzig
 - D) W. E. Deming
92. Which of the following elements transfers torque and is only subjected with the bending moment?
- A) Brake
 - B) Clutch
 - C) Axle
 - D) Belt drive
93. Which is not a possible type of failure in a riveted joint?
- A) Crushing failure of the plate
 - B) Shear failure of rivet
 - C) Tensile failure of the plate between rivets
 - D) Shear failure of plate
94. Which of the following correctly symbolizes a fillet joint?
- A) A right angled triangle
 - B) Two parallel lines with an arc above them
 - C) A triangle with an arc above it
 - D) A triangle
95. Which of the following is a type of Engineering Materials and is a Metal?
- A) Asbestos
 - B) Ferrous Metals
 - C) Non-Ferrous Metals
 - D) Both B and C

(Set - A)

(25)

[P.T.O.]

96. Which of the following is an example of a thermoplastic?
- A) Melamine
 - B) Epoxide
 - C) Urethane
 - D) Acetal
97. On average, what is the maximum use temperature of engineering ceramics?
- A) 2860°C
 - B) 6815°C
 - C) 3400°C
 - D) 2760°C
98. How is the creep strength of ceramics when compared to other materials?
- A) Low
 - B) High
 - C) Excellent
 - D) Zero
99. What is the mathematical expression of the first law of thermodynamics for a closed system?
- A) $Q = U + W$
 - B) $\Delta U = Q - W$
 - C) $Q = W - \Delta U$
 - D) $\Delta U = Q + W$
100. The Brayton cycle is commonly used in:
- A) Steam power plants
 - B) Refrigeration systems
 - C) Gas turbines
 - D) Diesel engines

101. Which statement accurately describes the Carnot refrigeration cycle?
- A) It has a higher COP than other refrigeration cycles
 - B) It operates with a single-phase working fluid
 - C) It is a reversible cycle that operates between two temperature reservoirs
 - D) It is most efficient when operating with a high-temperature reservoir only
102. The Kelvin-Planck statement of the second law of thermodynamics states that:
- A) Energy cannot be created or destroyed
 - B) Heat flows spontaneously from hot to cold
 - C) The entropy of a closed system cannot decrease
 - D) All processes tend towards equilibrium
103. The purpose of the condenser in a Rankine cycle is to:
- A) Increase the pressure of the working fluid
 - B) Superheat the steam before entering the turbine
 - C) Convert the steam to a liquid state
 - D) Increase the temperature of the working fluid
104. The term "relative humidity" refers to:
- A) The ratio of the partial pressure of water vapor to the saturation pressure
 - B) The ratio of the specific humidity to the dry-bulb temperature
 - C) The ratio of the dew point temperature to the wet-bulb temperature
 - D) The ratio of the wet-bulb temperature to the dry-bulb temperature
105. A fluid is considered incompressible if its:
- A) Viscosity is high
 - B) Density is constant
 - C) Temperature is low
 - D) Surface tension is negligible

106. The Reynolds number is used to determine the flow regime in a fluid based on the relationship between:

- A) Velocity and pressure
- B) Viscosity and density
- C) Surface tension and temperature
- D) Inertia and viscosity

107. The Venturi meter is based on the principle of:

- A) Viscosity measurement
- B) Pressure difference in a constriction
- C) Density change in a narrowing pipe
- D) Temperature change in a converging-diverging duct

108. A hydraulic turbine converts:

- A) Pressure energy into kinetic energy
- B) Kinetic energy into pressure energy
- C) Kinetic energy into mechanical energy
- D) Mechanical energy into potential energy

109. A fluid that has a constant viscosity but changes its density with changes in pressure is classified as:

- A) Newtonian fluid
- B) Incompressible fluid
- C) Compressible fluid
- D) Non-Newtonian fluid

110. TIG welding stands for:

- A) Torch Ignition Gas
- B) Tungsten Inert Gas
- C) Thermal Inductive Gas
- D) Theoretical Inverse Gas

(Set - A)

(28)

111. The material removed during machining is called:

- A) Swarf
- B) Swage
- C) Slug
- D) Slag

112. Milling involves cutting material using:

- A) A rotating tool with a single edge
- B) A rotating tool with multiple edges
- C) A stationary tool and a rotating workpiece
- D) A reciprocating tool

113. The term “grain boundary” refers to the boundary between:

- A) Two different types of lattices
- B) Two different crystal structures
- C) Individual atoms within a lattice
- D) Adjacent crystalline grains

114. A common defect in casting caused by improper mold compaction is called:

- A) Shrinkage
- B) Porosity
- C) Blowhole
- D) Hot tear

115. A milling cutter with teeth on its periphery and face is called a:

- A) End mill
- B) Slot mill
- C) Ball mill
- D) Fly cutter

116. An automobile designed for transporting goods is classified as a:
- A) Hatchback
 - B) Sedan
 - C) Coupe
 - D) Van
117. The term “compression ratio” in an engine refers to the ratio of the:
- A) Power output to the engine’s weight
 - B) Volume of the combustion chamber at bottom dead center to top dead center
 - C) Air-fuel mixture to exhaust gases
 - D) Engine’s displacement to its weight
118. A profilometer is a tool used to measure:
- A) Length
 - B) Angle
 - C) Surface roughness
 - D) Temperature
119. The device that ensures power is evenly distributed to the wheels while turning in an automobile is the:
- A) Transmission
 - B) Differential
 - C) Steering wheel
 - D) Brake pedal
120. CAM refers to:
- A) Computer-Aided Maintenance
 - B) Centralized Analysis and Manufacturing
 - C) Controlled Algorithmic Management
 - D) Computer-Aided Manufacturing

ROUGH WORK

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(Set - A)

(31)

[P.T.O.]

REAL WORK

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(Set - A)