CUET PG Mechanical Engineering - 2025 Question Paper

Time Allowed :1 Hour	Maximum Marks :300	Total Questions :75

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 1 hour duration.
2. The question paper consists of 75 questions. The maximum marks are 300.
3. 4 marks are awarded for every correct answer, and 1 mark is deducted for every wrong answer.

1. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ satisfies the matrix polynomial equation $A^2 - 4 + kI_2 = 0$, then determine the value of k.

(1) 2
(2) 1
(3) 3
(4) 0

---

2. What are the absolute maximum value and the absolute minimum value of a function $f(x) = \sin x + \cos x$ in the interval $[0, \pi]$?

(1) $\sqrt{2}$ and 1
(2) $\sqrt{2}$ and -1
(3) 2 and 1
(4) $\sqrt{2}$ and 0

---

3. A can hit a target 3 times in 5 shots, B 2 times in 5 shots, and C three times in 4 shots. All of them fire one shot each simultaneously at the target. What is the probability that at least two shots hit?

(1) $\frac{63}{100}$

(2) $\frac{9}{20}$

(3) $\frac{98}{20825}$

(4) $\frac{396}{10025}$

---

4. Using Poisson distribution, the probability that the ace of spades will be drawn from the pack of well-shuffled cards at least once in 104 consecutive trials is

(1) 0.765
(2) 0.894
(3) 0.675
(4) 0.865

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5. If $y = e^{(x+e)^{(x+e)^{(x+\cdots)}}}$, what is the value of $\frac{d}{dx}(y)$?

(1) $\frac{d}{dx}(y) = \frac{y}{1-y}$
(2) $\frac{d}{dx}(y) = \frac{y}{1+y}$
(3) $\frac{d}{dx}(y) = \frac{1-y}{1+y}$
(4) $\frac{d}{dx}(y) = \frac{1+y}{1-y}$

---

6. If $\frac{d}{dx}(y) = y \sin 2x$ and $y(0) = 1$, then what is the required solution?

(1) $y = e^{\cos x}$
(2) $y = e^{(\cos 2x)}$
(3) $y = e^{\sin x}$
(4) $y = 4 \sin x e^{\cos x}$

---

7. A population grows at the rate of 8

(1) $1 \times \log(2)$ years
(2) $\frac{25}{2} \times \log(2)$ years
(3) 10 years
(4) 12.5 years

---

8. The value of the integral $\int_C \frac{3\sigma^2+x}{z^2-1}\, dz$, where C is the circle $|z-1| = 1$, is

(1) $2\pi i$
(2) $4\pi i$

(3) $8\pi i$
(4) $-4\pi i$

---

9. Using the method of Regula Falsi, a root of the equation $x^3 + x^2 - 3x - 3 = 0$ lying between 1 and 2 is

(1) 1.627
(2) 1.728
(3) 1.023
(4) 1.975

---

10. A slider sliding at 15 m/s on a link which is rotating at 30 r.p.m, is subjected to Coriolis acceleration of magnitude

(1) $\frac{3\pi}{\text{m/s}^2}$
(2) 30 m/s^2
(3) $\frac{4\pi}{\text{m/s}^2}$
(4) 40 m/s^2

---

11. A vertical double-acting steam engine develops 75 kW at 250 r.p.m. The maximum fluctuation of energy is 30 percent of the work done per stroke. The maximum and minimum speeds are not to vary more than 1 percent on either side of the mean speed. What is the approximate mass of the flywheel required? If the radius of gyration is 0.6 m.

(1) 347 kg
(2) 447 kg
(3) 547 kg
(4) 647 kg

---

12. The height of a Watt's governor is expressed as

(1) $h = \frac{g}{\omega}$

(2) $h = \frac{2g}{\omega^2}$

(3) $h = \frac{g}{2\omega^2}$

(4) $h = \frac{g}{\omega^2}$

13. The maximum frictional force which comes into play when a body just begins to slide over another surface is called

(1) Sliding frictional force
(2) Rolling frictional force
(3) Kinetic frictional force
(4) Limiting frictional force

---

14. The strain energy stored in a body due to a suddenly applied load compared to when it is applied gradually is

(1) Two times
(2) Three times
(3) Four times
(4) No Change

---

15. The following conditions must be satisfied for a perfect truss (m = number of members, j = number of joints):

(1) $j = \frac{m+3}{2}$
(2) $j = \frac{m-3}{2}$
(3) $j = \frac{2m+3}{2}$
(4) $j = \frac{2m-3}{2}$

---

16. Structural steel forms neck before it breaks. Neck formation starts

(1) before limit of proportionality
(2) after yield strength
(3) before ultimate strength
(4) at ultimate strength

---

17. A principal plane is a plane of

(1) minimum tensile stress
(2) maximum tensile stress
(3) zero shear stress
(4) maximum shear stress

18. At a point on the beam where shear force changes signs, the bending moment at that point is

(1) zero
(2) decreasing
(3) maximum
(4) increasing

---

19. The polar section modulus for a circular shaft of diameter "d" is:

(1) $\frac{\pi d^3}{16}$
(2) $\frac{\pi d^3}{32}$
(3) $\frac{\pi d^3}{64}$
(4) $\frac{\pi d^3}{128}$

---

20. The critical speed of a rotating shaft depends upon

(1) mass
(2) stiffness
(3) mass and stiffness
(4) mass, stiffness and eccentricity

---

21. All the failure theories give nearly the same results when

(1) (A) and (B) only
(2) (B) only
(3) (C) only
(4) (A) only

---

22. For an insulated tip, the fin efficiency is given by

(1) $\frac{\cosh(ml)}{ml}$
(2) $\frac{\sinh(ml)}{ml}$
(3) $\frac{\tanh(ml)}{l}$
(4) $\frac{\tanh(ml)}{ml}$

23. After expansion from a gas turbine, the hot exhaust gases are used to heat the compressed air from a compressor with the help of a cross-flow compact heat exchanger of 0.8 effectiveness. What is the number of transfer units of the heat exchanger?

(1) 2
(2) 4
(3) 6
(4) 8

---

24. The ratio of is given as $\frac{E\lambda_1 b_2}{E\lambda_1 b_1}$ is given as:

(1) $\left(\frac{T_2}{T_1}\right)^5$
(2) $\left(\frac{T_2}{T_1}\right)^4$
(3) $\left(\frac{T_2}{T_1}\right)^3$
(4) $\left(\frac{T_2}{T_1}\right)^2$

---

25. A Newtonian fluid is defined as the fluid which

(1) is incompressible and non-viscous
(2) obeys Newton's law of viscosity
(3) is highly viscous
(4) is compressible and non-viscous

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26. Bernoulli's theorem deals with the law of conservation of

(1) Mass
(2) Momentum
(3) Energy
(4) Pressure

---

27. Match List-I with List-II

List-I	List-II
Dimensionless Numbers	**Relationship**
(A).Froude's Number	(I). $\frac{Pressure\ Force}{Inertia\ Force}$
(B). Mach's Number	(II). $\sqrt{\frac{Inertia\ force}{Gravity\ force}}$
(C). Euler's Number	(III). $\frac{Inertia\ Force}{Surface\ Tension\ Force}$
(D). Weber's Number	(IV). $\sqrt{\frac{Inertia\ force}{Elastic\ \ Force}}$

Choose the correct answer from the options given below:

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

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29. An aeroplane is flying at a height of 15 km, where the temperature is -50°C. Assuming $k = 1.4$ and $R = 287\,\text{J/K·kg}$, the approximate speed of the plane corresponding to $M = 2.0$ will be?

(1) 1955 km/hour
(2) 2055 km/hour
(3) 2155 km/hour
(4) 2255 km/hour

---

30. The thickness of a laminar boundary layer at a distance x from the leading edge over a flat plate varies as

(1) $x^{\frac{1}{5}}$
(2) $x^{\frac{1}{3}}$
(3) $x^{\frac{2}{3}}$
(4) $x^{\frac{1}{2}}$

---

31. The latent heat of vaporization at the critical point is

(1) less than zero
(2) greater than zero
(3) equal to zero
(4) equal to one

---

32. Match List-I with List-II

List-I	**List-II**
(A). Work done in a polytropic process	(I). $-\int v \, dp$
(B). Work done in a steady flow process	(II). Zero
(C). Heat transfer in a reversible adiabatic process	(III). $\frac{p_1V_1 - p_2V_2}{\gamma - 1}$
(D). Work done in an isentropic process	(IV). $\frac{p_1V_1 - p_2V_2}{n - 1}$

Choose the correct answer from the options given below:

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

---

33. Which thermodynamics law predicts correctly the degree of completion of a chemical reaction?

(1) Zeroth law
(2) First law
(3) Second law
(4) Third law

---

34. A refrigerating machine working on a reversed Carnot cycle takes out 2 kW of heat from the system while working between temperature limits of 300K and 200K. The coefficient of performance and power consumed by the cycle will be respectively:

(1) 1 and 1 kW
(2) 2 and 1 kW
(3) 1 and 2 kW
(4) 2 and 2 kW

---

35. Consider the following statements: (A) Availability is generally conserved. (B) Availability can neither be negative nor positive. (C) Availability is the maximum theoretical work obtainable. (D) Availability can be destroyed in irreversibilities.

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

---

36. Gas contained in a closed system consisting of a piston-cylinder arrangement is expanded. Work done by the gas during expansion is 50 kJ. The decrease in internal energy of the gas during expansion is 30 kJ. The heat transfer during the process is equal to:

1. -20 kJ
2. +20 kJ
3. -80 kJ
4. +80 kJ

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37. In a psychrometric chart, what does a vertical downward line represent?

1. Sensible cooling process
2. Adiabatic saturation process

3. Humidification process
4. Dehumidification process

---

38. Match List-I with List-II

List-I	**List-II**
(Details of the processes of the cycle)	**(Name of the cycle.)**
(A). Two adiabatic, one isobaric and two isochoric.	(I). Diesel
(B).Two adiabatic and two isochoric.	(II). Carnot
(C). Two adiabatic, one isobaric and one isochoric.	(III). Dual
(D). Two adiabatics, and two isothermals.	(IV). Otto

Choose the correct answer from the options given below:

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

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39. An impulse turbine produces 50 kW of power when the blade mean speed is 400 m/s. What is the rate of change of momentum tangential to the rotor?

(1) 200 N
(2) 175 N
(3) 150 N
(4) 125 N

---

40. In which one of the following materials the heat energy propagation is minimum due to conduction heat transfer?

(1) Lead
(2) Copper

(3) Water
(4) Air

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41. If the kinetic energy of the body with constant mass becomes four times the initial value, then the new momentum will be:

(1) four times the initial value
(2) three times the initial value
(3) two times the initial value
(4) same as the initial value

---

42. The Nusselt number is related to the Reynolds number in laminar and turbulent flows respectively as:

(1) $R \times e^{-0.5}$ and $R \times e^{0.8}$
(2) $R \times e^{0.5}$ and $R \times e^{0.8}$
(3) $R \times e^{-0.5}$ and $R \times e^{0}$
(4) $R \times e^{0.5}$ and $R \times e^{-0.8}$

---

43. The equation of free vibration of a system is $X + 36\pi^2 X = 0$. Its natural frequency is:

(1) 4 Hz
(2) 3 Hz
(3) 6π Hz
(4) 6 Hz

---

44. A body starting with initial velocity zero, moves in a straight line as per the law $s = 5t^3 - 3t^2 - 5$ (where s is distance in meters and t is time in seconds). The acceleration of the particle after 0.5 seconds will be:

(1) 1.8 m/s^2
(2) 9 m/s^2
(3) 10 m/s^2
(4) 11 m/s^2

---

45. According to maximum shear stress failure theory, yielding in material occurs when:

(1) Maximum shear stress = $\sqrt{2} \times$ yield stress
(2) Maximum shear stress = $2 \times$ yield stress
(3) Maximum shear stress = $2 \times$ yield stress
(4) Maximum shear stress = $\sqrt{\frac{2}{3}} \times$ yield stress

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46. During tensile tests on mild steel specimens, the following points are observed:
(A) Elastic limit
(B) Proportionality limit
(C) Yield Point
(D) Fracture point

Choose the correct sequence of observation after the application of loading:

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (B), (A), (C), (D)
4. (C), (B), (D), (A)

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47. Match List-I with List-II

List-I	**List-II**
Types of steel/Cast Iron (Iron - carbon diagram)	**% of Carbon**
(A) Hypo -eutectoid steel	(I) 0.8-2.0
(B) Hyper -eutectoid steel	(II) 4.3-6.67
(C) Hypo-eutectic Cast Iron	(III) 0.008-0.8
(D) Hyper eutectic Cast Iron	(IV) 2.0-4.3

Choose the correct answer from the options given below:

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

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48. The DC power source for arc welding has the characteristics $3V + I = 240$, where 'V' is the voltage in volts and 'I' is the current in amperes. For maximum power at the electrode, voltage should be set at:

(1) 40 V
(2) 140 V
(3) 220 V
(4) 240 V

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49. Match List-I with List-II

List-I	**List-II**
Machining Processes	**Mechanism of Material Removal Reaction**
(A) Chemical Machining	(I) Fusion and vaporisation
(B) Electro- Machining	(II) Corrosive
(C) Electro-chemical discharge Machining	(III) Erosion
(D) Ultrasonic Machining	(IV) Ion displacement

Choose the correct answer from the options given below:

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

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50. If a helical spring is halved in length, its spring stiffness remains:

(1) same
(2) halves
(3) doubles
(4) Triples

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51. Match List-I with List-II

List-I	List-II
Casting products	**Casting processes**
(A). Hollow statues	(I). Gravity die casting
(B). Dentures	(II). Slush casting
(C). Aluminum alloy pistons	(III). Shell moulding
(D). Rocker arms	(IV). Investment casting

Choose the correct answer from the options given below:

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

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52. Which of the following is a solid state joining process?

1. Gas tungsten arc welding
2. Friction welding
3. Submerged arc welding
4. Resistance spot welding

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53. Sine bar is specified by:

1. Its total length
2. The size of rollers
3. The weight of the sine bar
4. The center distance between two rollers

54. V-block used in the workshop to check:

(1) Surface roughness of workpiece
(2) Dimensions of oval job
(3) Taper on job
(4) Roundness of cylindrical job

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55. The power required for turning a mild steel rod is found to be 0.1 kW/cm^3/min. The maximum power available at the machine spindle is 4 kW. Assuming a cutting speed of 38 m/min and feed rate of 0.32 mm/rev, the maximum metal removal rate and depth of cut are respectively:

(1) 48 cm^3/min and 3.29 mm
(2) 40 cm^3/min and 3.29 mm
(3) 40 cm^3/min and 4.29 mm
(4) 48 cm^3/min and 4.29 mm

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56. Feed drives in CNC milling are provided by:

1. Servo Motors
2. Induction Motors
3. Stepper Motors
4. Synchronous Motors

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57. Order writing in the area of production planning and control is included in the phase of:

1. Action phase
2. Control phase
3. Planning phase
4. Both action and planning phase

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58. A company requires 16,000 units of raw material costing Rs 2 per unit. The cost of placing an order is Rs 100 and the carrying costs are 10

1. 4000 units.
2. 4040 units.
3. 4004 units.
4. 4400 units.

59. The integration of CAD and CAM is known as:

(1) CAE
(2) CAM alone
(3) CAD alone
(4) CIM

---

60. Simplex method is used for:

(1) Value Engineering
(2) Linear programming
(3) Queuing theory
(4) Network analysis

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61. If 'A' is the optimistic time, 'B' is the pessimistic time and 'C' is the most likely time of an activity, then the expected time of activity is:

(1) $\frac{A+4B+C}{6}$
(2) $\frac{4A+B+C}{6}$
(3) $\frac{A+B+4C}{6}$
(4) $\frac{4A+4B+C}{6}$

---

62. Arrange the following steps in the correct sequence for a basic mechatronic system: (A) Process the data in a micro-controller or processor (B) Generate a physical output using actuators (C) Sense input from the environment using sensors (D) Convert the output to a desired form (mechanical, electrical, etc.)
Choose the correct answer from the options given below:

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (C), (A), (B), (D)
4. (C), (B), (D), (A)

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63. Arrange the following elements of a feedback control loop in the correct order: (A) Actuator (B) Error detection (C) Controller (D) Feedback sensor
Choose the correct answer from the options given below:

1. (B), (C), (A), (D)
2. (A), (C), (B), (D)
3. (B), (A), (D), (C)
4. (C), (B), (D), (A)

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64. Which of the following describes the function of a sensor?

(1) Converts energy into motion
(2) Provide corrective option
(3) Processes data and controls actions
(4) Measures physical parameters

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65. Arrange the steps in the flow of power for a robotic arm, in the correct order:
(A) Controller sends signals to actuators
(B) Motion is transmitted to joints via gears or linkages.
(C) Input power source supplies energy
(D) Actuators convert electric energy into mechanical motion

Choose the correct answer from the options given below:

1. (A), (B), (C), (D)
2. (A), (C), (B), (D)
3. (C), (A), (D), (B)
4. (C), (B), (D), (A)

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66. Using a robot with 1 degree of freedom and having 1 sliding point with a full range of 1m, if the robot's control memory has a 12-bit storage capacity, then the control resolution for the axis of motion will be:

1. 0.144 mm
2. 0.244 mm
3. 0.344 mm
4. 0.444 mm

---

67. Match List-I with List-II

List-I	List-II
Terms	**Description**
(A). Mechatronics	(I). Converts digital signal to analog signal
(B). Actuators	(II). The integration of mechanics, electronics and computing
(C). D/A Converter	(III). Converts control signals into physical motion
(D). Servo Motor	(IV). A motor is designed for precise control of angular or linear positions.

Choose the correct answer from the options given below:

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

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68. The degrees of freedom of a SCARA robot are:

1. Two
2. Three
3. Four
4. Five

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69. The translatory joint in a robot is known as:

(1) Spherical
(2) Cylindrical
(3) Prismatic
(4) Revolute

---

70. Name of the device that selects between several analog or digital input signals and forwards the selected input to a single output line:

(1) Modulator
(2) Router
(3) LAN
(4) Multiplexer

71. Which one of the following symbols is used as the notation for designing arm and body of a robot, with joined arm configuration?

(1) TRL
(2) TLL LTL LVL
(3) LLL
(4) TRR

---

72. Which of the following is not an actuator?

(1) Hydraulic actuator
(2) Digital actuator
(3) Pneumatic actuator
(4) Electric actuator

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73. Which of the following is the most accurate method to measure the diameter of a cylindrical object?

(1) Vernier calipers
(2) Micrometer
(3) Digital calipers
(4) Gauge blocks

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73. Automated Guided Vehicle (AGV) robots can be placed in the category of:

(1) Mobile robot
(2) Neutral robot
(3) Saturated robot
(4) Unsaturated robot

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74. Proximity Sensors are used to:

(1) Detect non-magnetic but conductive materials
(2) Measure the strain
(3) Measure the distance
(4) Measure the temperature

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75. Which one of the following devices produces incremental motion through equal pulses?

(1) AC servomotor
(2) DC Servomotor
(3) Stepper motor
(4) Series motor
