POST GRADUATE COMMON ENTRANCE TEST-2017

DATE and TIME	COURSE	SUBJECT
01-07-2017 2.30 p.m. to 4.30 p.m.	ME/M.Tech/M.Arch/ courses offered by VTU/UVCE/UBDTCE	MECHANICA SCIENCES (AE/MC/IPE/IEM/MSE)

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
100	150 Minutes	120 Minutes

MENTION YOUR PGCET NO.						QUESTION BOOKLET DETAILS	
						VERSION CODE	SERIAL NUMBER
						D - 1	116320

DO's :
1. Check whether the PGCET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. Ensure whether the circles corresponding to course and the specific branch have been shaded on the OMR answer sheet.
3. This Question Booklet is issued to you by the invigilator after the 2nd Bell i.e., after 2.25 p.m.
4. The Serial Number of this question booklet should be entered and the respective circles should also be shaded completely on the OMR answer sheet.
5. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely on the OMR answer sheet.
6. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'Ts :
1. THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.
2. The 3rd Bell rings at 2.30 p.m., till then;
   - Do not remove the paper seal / polythene bag of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 75 (items) questions and each question will have one statement and four answers. (Four different options / responses.)
2. After the 3rd Bell is rung at 2.30 p.m., remove the paper seal / polythene bag of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc.. if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 120 minutes:
   - Read each question (item) carefully.
   - Choose one correct answer from out of the four available responses (options / choices) given under each question / item. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **only one response** for each item.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :

Ⓐ ● Ⓒ Ⓓ

4. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
5. After the **last Bell is rung at 4.30 p.m.,** stop marking on the OMR answer sheet and affix your **left hand thumb impression** on the OMR answer sheet as per the instructions.
6. Handover the **OMR ANSWER SHEET** to the room invigilator as it is.
7. After separating the top sheet (KEA copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
8. Preserve the replica of the OMR answer sheet for a minimum period of **ONE year.**
9. Only **Non-programmable** calculators are allowed.

Marks Distribution
PART-A : (Section 1) 30 Questions : 30 × 1 = 30 (Section 2) 15 Questions : 15 × 2 = 30
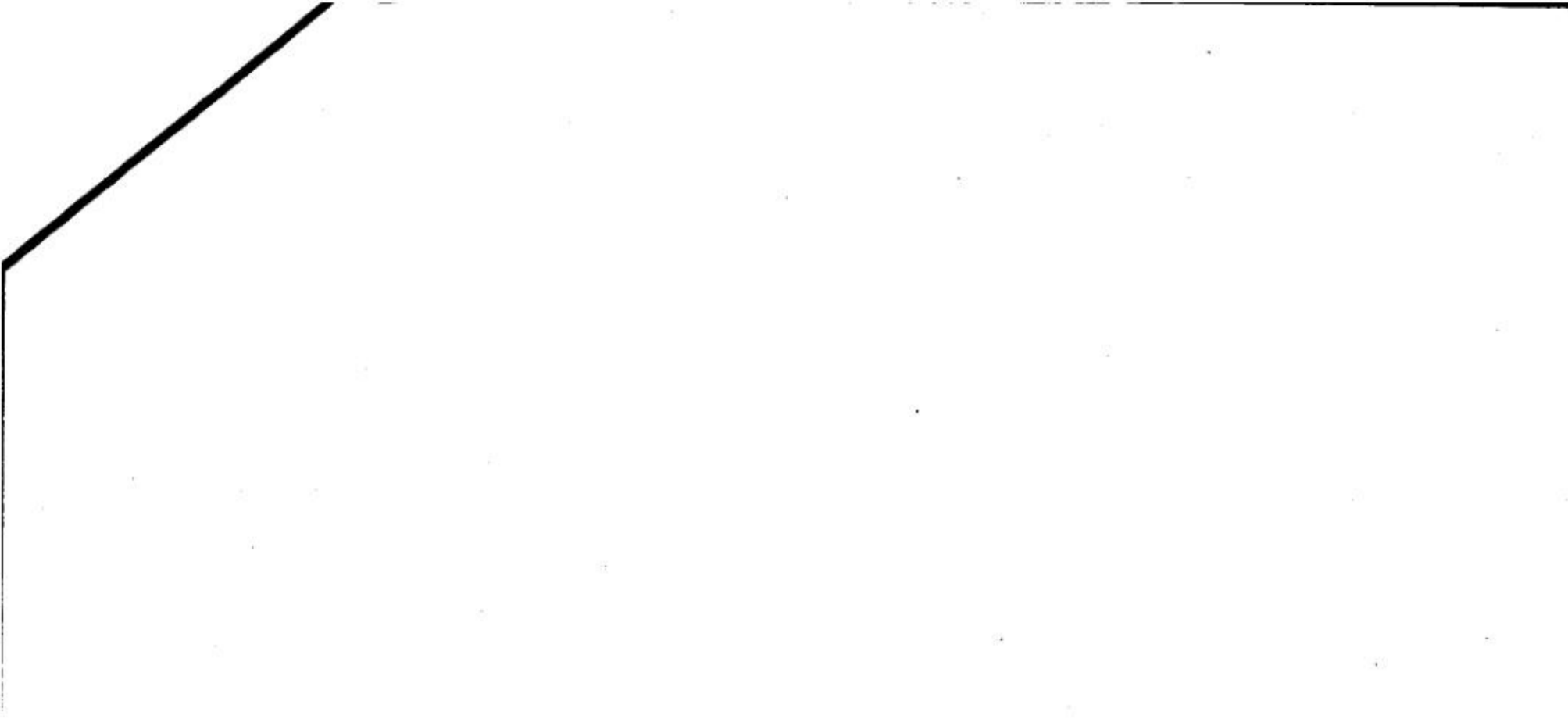PART-B : (Section 1) 20 Questions : 20 × 1 = 20 (Section 2) 10 Questions : 10 × 2 = 20

ME-D1

MECHANICAL SCIENCES
PART – A
(Common to AE / MC / IPE / IEM / MSE)
(SECTION – I)

Each question carries one mark.   **(30 × 1 = 30)**

1. Knocking tendency in a SI engine reduce with increasing

   (A) Compression ratio

   (B) Wall temperature

   (C) Super charging

   (D) Engine speed

2. A gas turbine cycle with infinitely large number of stages during compression and expansion leads to

   (A) Stirling cycle

   (B) Atkinson cycle

   (C) Ericsson cycle

   (D) Brayton cycle

3. Constant pressure lines in the superheated region of the mollier diagram will have

   (A) a positive slope

   (B) a negative slope

   (C) zero slope

   (D) positive and negative slope

4. The effect of rake angle on the mean friction angle is machining can be explained by

   (A) Sliding model friction

   (B) Sticking and then sliding model of friction

   (C) Sticking friction

   (D) Sliding and then sticking model of friction

5. In DC (welding, the straight polarity (electrode negative) result in

   (A) lower penetration

   (B) lower deposition rate

   (C) less heating of work piece

   (D) smaller weld pod

6. Among the conventional machining process, maximum specific energy is consumed in

   (A) Turning   (B) Drilling

   (C) Planning   (D) Grinding

7. Chills are used in moulds to

   (A) Achieve directional solidification

   (B) Reduce the possibility of the blow holes

   (C) Reduce freezing time

   (D) Smoothen metal flow for reducing splatter

Space For Rough Work

8. A Test Specimen is stressed slightly beyond the yield point and then unloaded, its yield strength will

   (A) decrease

   (B) increase

   (C) remain Same

   (D) become equal to ultimate strength

9. A static load is mounted at the centre of a shaft rotating at uniform angular velocity the shaft will be delighted for

   (A) the maximum Compressive Stress (Static)

   (B) the maximum tensile (static)

   (C) the maximum bending moment (static)

   (D) fatigue loading

10. Consider the system of simultaneous equations

   $$X + 2Y + Z = 6$$

   $$2X + Y + 2Z = 6$$

   $$X + Y + Z = 5 \text{ the system has}$$

   (A) unique solution

   (B) infinite number of solutions

   (C) no solutions

   (D) exactly two solutions

11. Laplace transformation of the function sin wt is

   (A) $\dfrac{S}{S^2 + w^2}$

   (B) $\dfrac{W}{S^2 + w^2}$

   (C) $\dfrac{S}{S^2 - w^2}$

   (D) $\dfrac{W}{S^2 - w^2}$

12. If $x = a(\theta + \sin\theta)$ and $y = a(1 - \cos\theta)$, then $\dfrac{dy}{dx}$ will be equal to

   (A) $\sin\left(\dfrac{\theta}{2}\right)$

   (B) $\cos\left(\dfrac{\theta}{2}\right)$

   (C) $\tan\left(\dfrac{\theta}{2}\right)$

   (D) $\cot\left(\dfrac{\theta}{2}\right)$

13. The sum of the eigen values of the matrix given below is

   $$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

   (A) 5

   (B) 7

   (C) 9

   (D) 18

14. Velocity vector of a flow field is given as $\overline{V} = 2xy\hat{i} - x^2 z\hat{j}$ the velocity vector at (1, 1, 1) is

   (A) $4\hat{i} - \hat{j}$

   (B) $4\hat{i} - \hat{k}$

   (C) $\hat{i} - 4\hat{j}$

   (D) $\hat{i} - 4\hat{k}$

Space For Rough Work

15. $\frac{PL^3}{3EI}$ is the deflection under the load P of a cantilever beam (length L, modulus of elasticity E, moment of inertia I) the strain energy due to bending is

(A) $\frac{P^2L^3}{3EI}$

(B) $\frac{P^2L^3}{6EI}$

(C) $\frac{P^2L^3}{4EI}$

(D) $\frac{P^2L^3}{48EI}$

16. For the case of a slender column of length l and flexural rigidity EI built in at its base and free at the top, the entire critical buckling load is

(A) $\frac{4\pi^2EI}{l^2}$

(B) $\frac{2\pi^2EI}{l^2}$

(C) $\frac{\pi^2EI}{l^2}$

(D) $\frac{\pi^2EI}{4l^2}$

17. The ratio of average shear stress to maximum shear stress in a beam with a square cross section is

(A) 1

(B) $\frac{2}{3}$

(C) $\frac{3}{2}$

(D) 2

18. Which theory of failure will you use for aluminium components under steady loading ?

(A) Principal stress theory

(B) Principal strain theory

(C) Strain energy theory

(D) Maximum shear stress theory

19. A rod of length L and diameter D is subjected to tensile load P, which of the following is sufficient to calculate the resulting change in diameter

(A) Young's modulus

(B) Shear modulus

(C) Poisson's ratio

(D) Young's modulus and shear modulus

20. Starting friction is low in

(A) Hydrostatic lubrication

(B) Hydro dynamic lubrication

(C) Mixed (or semi-fluid) lubrication

(D) Boundary lubrication

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

(A) Cycloidal motion

(B) Simple harmonic function

(C) Parabolic function

(D) 3-4-5 polynomial function

22. A key connecting a flange coupling to a shaft is likely to fail in

(A) Shear

(B) Tension

(C) Torsion

(D) Bending

Space For Rough Work

23. The number of degree of freedom of a planar linkage with 8 links and 9 simple revolute joint is

(A) 1   (B) 2

(C) 3   (D) 4

24. Which one of the following is a criterion in the design of hydrodynamic journal bearing ?

(A) Sommerfeld number

(B) Rating life

(C) Specific dynamic capacity

(D) Rotation factor

25. Stream lines, path lines and streak lines are virtually identical for

(A) Uniform flow

(B) Flow of identical fluids

(C) Steady flow

(D) Non-uniform flow

26. Prandtl's mixing length is turbulent flow signifies

(A) the average distance perpendicular to the mean flow covered by the mixing particles

(B) the ratio of mean free path to characteristic length of the flow field

(C) the wavelength corresponding to the lowest frequency present in the flow field

(D) the magnitude of the turbulent kinetic energy

27. In flow through a pipe, the transition from laminar to turbulent flow does not depends on

(A) velocity of the fluid

(B) density of the fluid

(C) diameter of pipe

(D) length of the pipe

28. Kaplan turbine is

(A) a high head mixed flow turbine

(B) a low axial flow turbine

(C) an outward flow reaction turbine

(D) an impulse inward flow turbine

29. If V_N and α are the nozzle exit velocity and nozzle angle in an impulse turbine, the optimum blade velocity is given by

(A) $V_N \cos 2\alpha$ (B) $V_N \sin 2\alpha$

(C) $\dfrac{V_N \cos \alpha}{2}$ (D) $\dfrac{V_N^2}{2}$

30. In steam and other vapour cycle, the process of removing non-condensable is called

(A) Scavenging process

(B) Degeneration process

(C) Exhaust process

(D) Condensation process

Space For Rough Work

MECHANICAL SCIENCES
PART – A
## (SECTION – II)
Each question carries two marks. $(15 \times 2 = 30)$

31. A single acting two stage compressor with complete intercooling delivers air at 16 bar. Assuming an intake state of 1 bar at 15 °C, the pressure ratio per stage is
    (A) 16   (B) 8
    (C) 4   (D) 2

32. In a gas turbine, hot combustion products with the specific heats $C_p = 0.98$ kJ/kg – K, $C_v = 0.7538$ kJ/kg K enter the turbine at 20 bar, 1500 K and exit at 1 bar. The Isentropic efficiency of the turbine is 0.94. The work developed by the turbine per kg of gas flow is
    (A) 688.04 kJ/kg   (B) 794.66 kJ/kg
    (C) 1009.72 kJ/kg (D) 1312.00 kJ/kg

33. If the principal stress in a plane stress problems, are $\sigma_1 = 100$ MPa, $\sigma_2 = 40$ MPa, the magnitude of the maximum shear stress (in MPa) will be
    (A) 60   (B) 50
    (C) 30   (D) 20

34. In the Taylor Series expansion of e^X about $X = 2$, the co-efficient of $(X - 2)^4$ is
    (A) $\dfrac{1}{4!}$ (B) $\dfrac{2^4}{4!}$
    (C) $\dfrac{e^2}{4!}$ (D) $\dfrac{e^4}{4!}$

35. A ball bearing operating at a load F has 8000 hours of life. The life of the bearing, in hours, when the load is doubled to 2F is
    (A) 8000   (B) 6000
    (C) 4000   (D) 1000

36. The height of the down-sprue is 175 mm and its c/s area at the base is 200 m². The c/s area of the horizontal runner is also 200 mm². Assuming no losses, Indicate the correct choice for the time (in seconds) required to fill a mold cavity of volume 10^6 mm³.
    (Use g = 10 m/s²)
    (A) 2.67   (B) 8.45
    (C) 26.72   (D) 84.50

37. A direct current welding machine with a linear power source characteristic provides open circuit voltage of 80 V and short circuit current of 800 A. During welding with the machine, the measured arc current is 500 A corresponding to an arc length of 5.0 mm and the measured arc current is 460 A corresponding to an arc length of 7.0 mm. The linear voltage (E) – arc length (L) characteristic of the welding arc can be given as (where E is in volt and L is mm)
    (A) E = 20 + 2L   (B) E = 20 + 8L
    (C) E = 80 + 2L   (D) E = 80 + 8L

38. A box contains 2 washers, 3 nuts and 4 bolts. Items are drawn from the box at random one at a time without replacement. The probability of drawing 2 washers first followed by 3 nuts and subsequently the 4 bolt is
    (A) 2/315   (B) 1/630
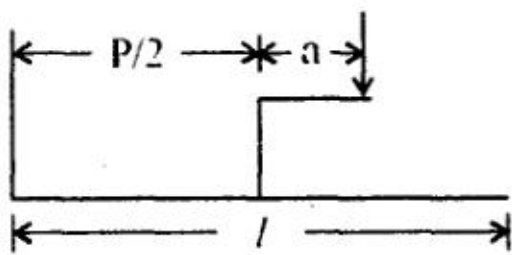   (C) 1/1260   (D) 1/2520

Space For Rough Work

39. A large uniform plate containing a rivet-hole is subjected to uniform uni axial tension of 95 MPa the maximum stress in the plate is

95 MPa
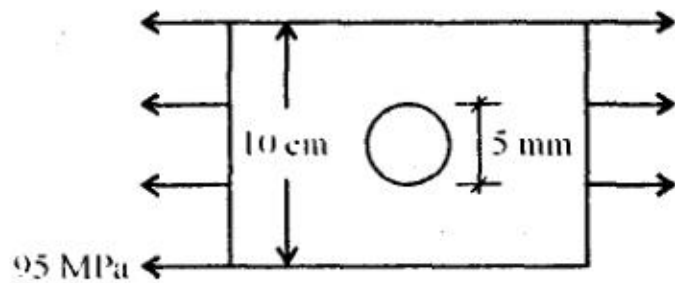
(A) 100 MPa (B) 285 MPa

(C) 190 MPa (D) Indeterminate

40. A simply supported beam carries a load 'P' through a bracket, as shown in figure the maximum bending moment in the beam is

(A) $\dfrac{Pl}{2}$ (B) $\dfrac{Pl}{2}+\dfrac{ap}{2}$

(C) $\dfrac{Pl}{2}+ap$ (D) $\dfrac{Pl}{2}-ap$

41. The outside diameter of a hollow shaft is twice its inside diameter. The ratio of its torque carrying capacity to that of a solid shaft of the same material and the same outside diameter is

(A) $\dfrac{15}{16}$ (B) $\dfrac{3}{4}$

(C) $\dfrac{1}{2}$ (D) $\dfrac{1}{16}$

42. A band brake having band-width of 80 mm, drum diameter of 250 mm, co-efficient of friction of 0.25 and angle of wrap of 270 degrees is required to exert a friction torque of 1000 N-m the maximum tension (in kN) developed in the band is

(A) 1.88 (B) 3.56

(C) 6.12 (D) 11.56

43. Kinematic viscocity of air at 20 °C is given to be 1.6×10^{-5} m²/s, its kinematic viscocity at 70 °C will be vary approximately

(A) 2.2×10^{-5} m²/s

(B) 1.6×10^{-5} m²/s

(C) 1.2×10^{-5} m²/s

(D) 10^{-5} m²/s

44. A closed cylinder having a radius R and height H is filled with oil density ρ. If the cylinder is rotated about its axis at an angular velocity of W, the thrust at the bottom of the cylinder is

(A) $\pi R^2 \rho g H$

(B) $\pi R^2 \dfrac{\rho W^2 R^2}{4}$

(C) $\pi R^2 (\rho W^2 R^2 + \rho g H)$

(D) $\pi R^2 \left(\dfrac{\rho W^2 R^2}{4} + \rho g H \right)$

45. One kilo mole of an ideal gas is throttled from an initial pressure of 0.5 MPa to 0.1 MPa the initial temperature is 300 K, the entropy change of the universe is

(A) 13.38 kJ/K (B) 401.3 kJ/K

(C) 0.0446 kJ/K (D) − 0.0446 kJ/K

Space For Rough Work

PART – B
AE : Automobile Engineering
SECTION-I
(Each question carries one mark)   **(20 × 1 = 20)**

46. The term 'Allowance' in limits and fits is usually referred to

    (A) Minimum clearance between shaft and hole.

    (B) Maximum clearance between shaft and hole.

    (C) Difference of tolerances of hole & shaft.

    (D) Difference between maximum and minimum size of hole.

47. In limits and fits system, basic shaft system is one whose

    (A) Lower deviation is zero

    (B) Upper deviation is zero

    (C) Minimum clearance is zero

    (D) Maximum clearance is zero

48. Raster CRT eliminates

    (A) Flicker and slow update

    (B) Flicker only

    (C) Slow update only

    (D) Has no effect

49. Integration of CAD and CAM is known as

    (A) CIM

    (B) CAE

    (C) CAM

    (D) CAD

50. The APT language is used with

    (A) Drafting system

    (B) NC machines

    (C) Programmable controllers

    (D) Large automation systems

51. The axis of movement of a robot may include

    (A) elbow rotation

    (B) wrist rotation

    (C) X-Y co-ordinate motion

    (D) spatial co-ordinate system

Space For Rough Work

52. The drive for mechanical fuel pump is taken from the

(A) Crank shaft

(B) Cam shaft

(C) Distributor shaft

(D) Fly wheel

53. Exhaust valve face angle is generally

(A) 30°   (B) 45°

(C) 60°   (D) 75°

54. Coolant pumps are of

(A) Vane type

(B) Reciprocating type

(C) Centrifugal type

(D) Axial type

55. The most accurate timer for electronic ignition is the

(A) Diode

(B) Transistor

(C) Hall effect switch

(D) Pulse generator

56. The positive plate of a lead – acid battery has

(A) PbO_2 (B) Pb

(C) $PbSO_4$ (D) H_2SO_4

57. The number of windings in the stator of an alternator is

(A) 1   (B) 2

(C) 3   (D) 4

58. The stalling torque of starting motors for cars vary between

(A) 10 to 30 Nm   (B) 30 to 60 Nm

(C) 60 to 100 Nm   (D) 100 to 200 Nm

59. The equation of motion for a damped viscous vibration is $3\ddot{x} + 9\dot{x} + 27x = 0$. The damping factor will be

(A) 0.25   (B) 0.5

(C) 0.75   (D) 1.00

Space For Rough Work

60. When $\dfrac{w}{w_n} > \sqrt{2}$, the transmissibility will be

(A) > 1

(B) < 1

(C) equal to 1

(D) $\dfrac{1}{\sqrt{2}}$

61. Whirling speed of a shaft coincides with the natural frequency of

(A) Longitudinal vibration

(B) Transverse vibration

(C) Torsional vibration

(D) Coupled between torsional vibrations

62. IC engine connecting rods are designed with end fixity conditions

(A) Both ends fixed

(B) Both ends free

(C) Both ends hinged

(D) One end fixed and other free

63. Piston rings are provided for the purpose of

(A) Sealing the either side of piston

(B) Increasing fuel supply

(C) Locking the piston

(D) Reducing cylinder wear

64. The size of inlet valve of an engine in comparison with exhaust valve is

(A) more

(B) less

(C) same

(D) either more or less

65. The surface roughness on a drawing is represented by

(A) circles

(B) squares

(C) zig zag lines

(D) triangles

Space For Rough Work

SECTION-II

(Each question carries two marks.) (10 × 2 = 20)

66. A pulse generator consists of a

    (A) Permanent magnet, ignition coil and electronic control unit.

    (B) Permanent magnet, reluctor and electronic control unit.

    (C) Ignition coil, reluctor and electronic control unit.

    (D) Permanent magnet, reluctor & timer coil.

67. Dimension of the hole is $50^{+0.02}_{0.00}$ mm and shaft is $50^{+0.02}_{0.00}$ mm, the minimum clearance is

    (A) 0.02 mm

    (B) 0.00 mm

    (C) −0.02 mm

    (D) 0.01 mm

68. Knocking in SI engine decreases in which of the following orders of the combustion chamber designs ?

    (A) F head, L head, I head

    (B) T head, L head, F head

    (C) I head, T head, F head

    (D) F head, I head, T head

69. By higher octane number of SI fuel, it is meant that the fuel has

    (A) higher heating value

    (B) higher flash point

    (C) lower volatility

    (D) longer ignition delay

70. The colours of positive & negative plates of a lead acid battery are

    (A) Brown and grey

    (B) Grey and red

    (C) White and Black

    (D) Red and Blue

Space For Rough Work

71. To increase the output voltage, battery cells are connected in

(A) Series

(B) Parallel

(C) Series – Parallel

(D) No change in any case

72. For a vibrating system under steady forced vibrations, if frequency ratio is very high, the phase angle would tend to approach

(A) 0°

(B) 90°

(C) 180°

(D) 270°

73. If the damping ratio is r and natural frequency is w_n, the frequency of damped vibration is

(A) $w_n \sqrt{1 - r^2}$

(B) $r\, w_n$

(C) $w_n \sqrt{1 - 2r^2}$

(D) $\dfrac{w_n}{r}$

74. The frequency of a vibrating contact type regulator for d.c. generator is

(A) 20 Hz

(B) 200 Hz

(C) 20 per minute

(D) 200 per minute

75. Inertia type drives are commonly employed in

(A) Cars

(B) Light transport vehicles

(C) Heavy transport vehicles

(D) Cross – country vehicles

Space For Rough Work

PART – B
MC : Mechanical Engineering
SECTION-I
(Each question carries one mark)   (20 × 1 = 20)

46. Example for tactile sensor is

    (A) Limit switch

    (B) Hall-effect sensor

    (C) Light sensor

    (D) Magnetic sensor

47. Which of the following does not belongs to electrical actuator ?

    (A) Relay switch

    (B) Stepper motor

    (C) Servo motor

    (D) Solenoid

48. Streamlines, path lines and streak lines are virtually identical for

    (A) Uniform flow

    (B) Flow of ideal fluid

    (C) Steady flow

    (D) Non-uniform flow

49. The Parsons reaction turbine has

    (A) identical fixed and moving blade

    (B) only fixed blade

    (C) only moving blade

    (D) fixed and moving blade of different shape

50. A turbine is said to have an axial discharge when the steam leaves the blade tip at an angle of (with respect to the direction of blade motion)

    (A) 180°

    (B) 60°

    (C) 270°

    (D) 90°

51. De-laval turbine is a

    (A) Single rotor impulse turbine

    (B) Multi rotor impulse turbine

    (C) Impulse reaction turbine

    (D) Multi rotor reaction turbine

52. The ratio of the work done on the blades to the energy supplied to the blades, is called

    (A) Nozzle efficiency

    (B) Blade efficiency

    (C) Mechanical efficiency

    (D) Gross or stage efficiency

Space For Rough Work

53. The one dimensional heat convection partial differential equation $\frac{\partial T}{\partial t} = \frac{\partial^2 T}{\partial x^2}$ is

(A) Parabolic

(B) Hyperbolic

(C) Elliptic

(D) Mixed

54. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for

(A) Copper

(B) Steel

(C) Glass-wool

(D) Refractory-brick

55. In a radiative heat transfer, a gray surface is one

(A) which appears gray to the eye

(B) whose emissivity is independent of wavelength

(C) which has reflectivity equal to zero

(D) which appears equally bright from all directions

56. For the same inlet and outlet temperature of hot and cold fluids, the log mean temperature difference (LMTD) is

(A) greater for parallel flow heat exchanger than for counter flow heat exchanger

(B) greater for counter flow heat exchanger than for parallel flow heat exchanger

(C) Same for both parallel and counter flow exchanger

(D) depends on properties of fluids

57. In PERT, the distribution activity timer is assumed to be

(A) Normal

(B) Gamma

(C) Beta

(D) Exponential

58. A dummy activity is used in PERT network to describe

(A) Precedence Relationship

(B) Necessary time delay

(C) Resource restriction

(D) Resource idleness

Space For Rough Work

59. In PERT analysis a critical activity has
    (A) maximum float
    (B) zero float
    (C) maximum cost
    (D) minimum cost

60. The dimensional limits on a shaft of 25h7 are
    (A) 25.000, 25.021 mm
    (B) 25.000, 24.979 mm
    (C) 25.000, 25.007 mm
    (D) 25.000, 24.993 mm

61. A ring gauge is used to measure
    (A) outside diameter but not roundness
    (B) roundness but not outside diameter
    (C) both outside diameter and roundness
    (D) only external thread

62. The hole is specified as $400.000^{0.050}$ mm the mating shaft has a clearance fit with minimum clearance of 0.01 mm. The tolerance on the shaft is 0.04 mm the maximum clearance in mm between the hole and the shaft is
    (A) 0.04
    (B) 0.05
    (C) 0.10
    (D) 0.11

63. In a CNC program block, N002 G02 G91 X40 240, G02 and G91 refer to
    (A) circular interpolation CCW and incremental dimension
    (B) circular interpolation CCW and absolute dimension
    (C) circular interpolation CW and incremental dimension
    (D) circular interpolation CW and absolute dimension

64. NC contouring is an example of
    (A) Continuous path positioning
    (B) Point to point positioning
    (C) Absolute positioning
    (D) Incremental positioning

65. In a point to point type of NC system
    (A) control of position and velocity of the tool is essential
    (B) control of only position of the tool is sufficient
    (C) control of only velocity of the tool is sufficient
    (D) neither position nor velocity need to be controlled

Space For Rough Work

SECTION-II

(Each question carries two marks) (10 × 2 = 20)

66. A project consists of three parallel paths with mean durations and variance of (10, 4), (12, 4) and (12, 9) respectively. According to the standard PERT assumptions, the distribution of the project duration is

    (A) Beta with mean 10 and standard deviation 2

    (B) Beta with mean 12 and Standard deviation 2

    (C) Normal with mean 10 and Standard deviation 3

    (D) Normal with mean 12 and Standard deviation 3

67. Simplex method of solving linear programming problem uses

    (A) all the points in the feasible region.

    (B) only the corner points of the feasible region.

    (C) intermediate points within the feasible region.

    (D) only interior points in the feasible region.

68. The radiative heat transfer rate per unit area (W/m^2) between two plane parallel grey surface (emissivity = 0.9) maintained at 400 K and 300 K is

    (A) 992   (B) 812

    (C) 464   (D) 567

69. For a current carrying wire of 20 mm diameter exposed to air

    (h = 25 W/m^2K) maximum heat distribution occurs when the thickness of insulation (k = 0.5 W/mk) is

    (A) 20 mm   (B) 10 mm

    (C) 2.5 mm   (D) 0 mm

70. In a certain heat exchanger, both the fluids have identical mass flow rate specific heat product. The hot fluids enters at 76 °C and leaves at 47 °C and the cold fluid entering at 26 °C leaves at 55 °C. The effectiveness of the heat exchanger is

    (A) 0.16

    (B) 0.58

    (C) 0.72

    (D) 1.0

Space For Rough Work

71. In finish machining of an Island on a casting with CNC milling machine, an end will with 10 mm diameter is employed. The corner points of the Island are represented by $(0, 0)$, $(0, 30)$, $(50, 30)$ and $(50, 0)$. By applying cutter radius right compensation, the trajectories of the cutter will be

(A) $(-5, 0)$, $(-5, 35)$, $(55, 35)$, $(55, -5)$, $(-5, -5)$

(B) $(0, -5)$, $(55, -5)$, $(55, 35)$, $(-5, 35)$, $(-5, -5)$

(C) $(5, 5)$, $(5, 25)$, $(45, 25)$, $(45, 5)$, $(5, 5)$

(D) $(5, 5)$, $(45, 5)$, $(45, 25)$, $(5, 25)$, $(5, 5)$

72. During the execution of a CNC part program block N20 G02 X45 Y25 R5 the type of tool motion will be

(A) Circular interpolation — clockwise

(B) Circular interpolation — counter clockwise

(C) Linear interpolation

(D) Rapid feed

73. A Francis turbine running at 200 rpm develops a power of 5000 kW under a head of 25 m. Determine the speed and power output under a head of 100 m

(A) 20,000 kW

(B) 10,000 kW

(C) 40,000 kW

(D) 30,000 kW

74. Consider the following linear programming problem :

Maximum $Z = 3x_1 + 2x_2$

Subject to $x_1 \leq 4$

$x_2 \leq 6$

$3x_1 + 2x_2 \leq 18$

$x_1 \geq 0, x_2 \geq 0$

(A) The LPP has a unique optimal solution

(B) The LPP is infeasible

(C) The LPP is unbounded

(D) The LPP has multiple optimal solutions

75. The expected time (t_e) of a PERT activity in terms of optimistic time (t_o), pessimistic time (t_p) and most likely time (t_l) is given by

(A) $t_e = \dfrac{t_o + 4t + t_p}{6}$

(B) $t_e = \dfrac{t_o + 4t_p + t_l}{6}$

(C) $t_e = \dfrac{t_o + 4t_l + t_p}{3}$

(D) $t_e = \dfrac{t_o + 4t_l + t_l}{3}$

Space For Rough Work

PART – B

IPE : Industrial and Production Engineering
SECTION-I
(Each question carries one mark)   **(20 × 1 = 20)**

46. The ability of a tool material to resist shock to impact forces is known as
    - (A) Wear resistance
    - (B) Toughness
    - (C) Red hardness
    - (D) Machine ability

47. The equation $VT^n = C$ is known as Taylor's equation. The value of n for HSS tools is
    - (A) 0.1 to 0.15
    - (B) 0.2 to 0.25
    - (C) 0.3 to 0.4
    - (D) 0.4 to 0.55

48. In computer aided drafting, an arc is defined by
    - (A) two end points only
    - (B) centre and radius
    - (C) radius and one end point
    - (D) two end points and centre

49. Cold working of metal increases
    - (A) Tensile strength
    - (B) Hardness
    - (C) Yield strength
    - (D) All of these

50. A process, in which the cross-sectional area of bars, rods or tubes in the desired area is reduced by repeated blows, is called
    - (A) Extrusion
    - (B) Piercing
    - (C) Swaging
    - (D) Reaming

51. Error regularly repetitive in nature is called
    - (A) Random error
    - (B) Systematic error
    - (C) Progressive error
    - (D) Standard error

52. Tolerance are basically specified
    - (A) to obtain desired fits
    - (B) to obtain high accuracy
    - (C) because it is not possible to manufacture in size exactly
    - (D) to have proper allowance

53. Millimeter scale in a micrometer is marked on
    - (A) Barrel
    - (B) Thimble
    - (C) Spindle
    - (D) Anvil

Space For Rough Work

54. Which one of the following is the basic tool in work study ?

(A) Stop watch

(B) Process chart

(C) Bar chart

(D) Planning chart

55. Standard time is equal to

(A) normal time + Idle time

(B) normal time + allowance

(C) normal time + Idle time + allowance

(D) normal time – allowance

56. At the break-even point

(A) Fixed cost and variable cost are equal

(B) Sales revenue and total cost are equal

(C) Sales revenue is more than total cost

(D) Sales revenue is less than total cost

57. If utilization factor is less than one and service facility is idle, then probability is given by

(A) $p_o = 1 + \dfrac{\lambda}{\mu}$

(B) $p_o = 1 - \dfrac{\mu}{\lambda}$

(C) $p_o = 1 + \dfrac{\mu}{\lambda}$

(D) $p_o = 1 - \dfrac{\lambda}{\mu}$

58. If the equipment down time due to each inspection = 3 hrs, the equipment down time due to each breakdown = 16 hrs and k = 3 per month, then the optimum inspection frequency would be equal to

(A) 8 per month

(B) 2 per month

(C) 4 per month

(D) 1 per month

Space For Rough Work

59. If total item consumed per year = 2000, procurement cost per order = ₹ 10 and annual inventory carrying cost per item = ₹ 1.0, then the most economic order quantity would be equal to

(A) 200

(B) 100

(C) 300

(D) 400

60. Which of the following methods are used to solve linear programming problems ?

(A) Simplex method

(B) Graphical method

(C) Transportation method

(D) All of these

61. Which of the following networks are the techniques of the project management ?

(A) CPM

(B) PERT

(C) MIS

(D) Only (A) and (B)

62. The expected time (t_E) in terms of optimistic time (t_O), pessimistic time (t_P) and most likely time (t_L) is given by

(A) $t_E = \dfrac{t_O + t_L + t_P}{3}$

(B) $t_E = \dfrac{4t_O + t_L + t_P}{3}$

(C) $t_E = \dfrac{t_O + 4t_L + t_P}{6}$

(D) $t_E = \dfrac{t_O + 4t_L + t_P}{3}$

63. If the total float is negative, the activity is called

(A) Sub-critical

(B) Super-critical

(C) Critical

(D) None of these

64. The thickness of the chip is minimum at the beginning of the cut and maximum at the end of the cost in case of

(A) Climb milling

(B) Down milling

(C) Face milling

(D) Up milling

65. The cutting tool in a milling machine is held in position by

(A) arbor

(B) spindle

(C) column

(D) knee

Space For Rough Work

SECTION-II
(Each question carries two marks) (10 × 2 = 20)

66. A tooth paste tube can be produced by

    (A) Solid forward extrusion

    (B) Solid backward extrusion

    (C) Hollow forward extrusion

    (D) Hollow backward extrusion

67. While producing a few ports with an accuracy of 0.01 mm, it would be preferable to select

    (A) an automatic machine tool

    (B) numerical controlled machine tool

    (C) transfer machine tool

    (D) None of these

68. Rate at which scanning is repeated is called

    (A) Stroke rate

    (B) Resolution

    (C) Refresh rate

    (D) Bandwidth

69. A shaft (of diameter $30\,^{+0.05}_{-0.15}$ mm) and a hold (of diameter $30\,^{+0.20}_{+0.1}$ mm) when assembled would yield

    (A) Transition fit

    (B) Interference fit

    (C) Clearance fit

    (D) None of these

70. A hole is specified as $40\,^{0.050}_{0.000}$ mm. The mating shaft has a clearance fit with minimum clearance of 0.01 mm. The tolerance on the shaft is 0.04 mm. The maximum clearance in mm between the hole and the shaft is

    (A) 0.04

    (B) 0.10

    (C) 0.11

    (D) 0.15

Space For Rough Work

71. A PERT activity has an optimistic time of three days, pessimistic time of 15 days and the expected time is 7 days. The most likely time of the activity is

(A) 4 days

(B) 5 days

(C) 5½ days

(D) 6 days

72. The mean and standard deviation of project completion time are 16 days and 2.44 respectively. The probability that the project would be completed with 15 days, will be

(A) 34%

(B) 40%

(C) 60%

(D) 66%

73. If the tool life relationship for HSS tool is $VT^{1/8} = C_1$, and for tungsten carbide is $VT^{0.2} = C_2$, and tool life for both at cutting speed of 25 m/min is equal and is 3 hours in each case, what is the ratio of their lives at a speed of 32 m/min ?

(A) 1.08

(B) 1.58

(C) 2.08

(D) 2.58

74. A body which is free in space has _____ degrees of freedom.

(A) Two

(B) Three

(C) Four

(D) Six

75. A hole of 1 mm is to be drilled in a glass plate. It could be best done by

(A) Laser drilling

(B) Plasma arc drilling

(C) Ultrasonic method

(D) Electron Beam drilling

Space For Rough Work

PART – B

IEM : Industrial Engineering and Management

SECTION-I

(Each question carries one mark)   **(20 × 1 = 20)**

46. This set of database SQL used date must be specified in the format
    - (A) mm/dd/yy
    - (B) yyyy/dd/mm
    - (C) yyyy/mm/dd
    - (D) dd/mm/yy

47. The purpose of supply chain management is
    - (A) Integrating supply and demand management
    - (B) Improve quality of the product
    - (C) Increase production
    - (D) Improve and provide customer satisfaction

48. A line with a tapering width can be easily created by using _____ tool.
    - (A) circle
    - (B) line
    - (C) polyline
    - (D) eclipse

49. If you use the absolute coordinate system to create a line from a starting point of 0, 0.8 units on the X axis and 5 units on the Y axis you enter _____ for the second point.
    - (A) 5, 0
    - (B) 0, 8
    - (C) 5, 8
    - (D) 8, 5

50. If a measuring tape is too long as compared to standard, the error will be known as
    - (A) Natural error
    - (B) Personal error
    - (C) Manufacturing error
    - (D) Instrumental error

51. Basic hole and basic shaft are those whose upper deviation and lower deviation are
    - (A) Minimum, minimum
    - (B) Maximum, minimum
    - (C) Zero, zero
    - (D) Maximum, zero

52. Ergonomics is related to human
    - (A) Comfort
    - (B) Safety
    - (C) Both (A) and (B)
    - (D) Condition status

53. The quantitative information is one which concerns the
    - (A) value of some variable
    - (B) rate of change
    - (C) condition or status of a system
    - (D) presence or absence of some specific object

54. Production cost refers to prime cost plus
    - (A) factory administration and sales overheads
    - (B) factory overheads
    - (C) factory, administration, sales overheads and profit
    - (D) factory and administration overheads

55. A graphical device used to determine the break-even point and profit under varying conditions of output and costs, is known as
    - (A) Gnatt chart
    - (B) Flow chart
    - (C) Break-even chart
    - (D) PERT chart

Space For Rough Work

56. PERT and CPM are

(A) Techniques to determine project status

(B) Aids to the decision maker

(C) Aids to determine cost

(D) Decision making techniques

57. Which of the following is not a Therblig ?

(A) Use   (B) Hold

(C) Dispatch   (D) Inspection

58. _____ handling method widely used in cement industries.

(A) Belt conveyor

(B) Fork life track

(C) Crane

(D) Bucket conveyor

59. The type of organization preferred for an automobile industry is

(A) line organisation

(B) line and staff organisation

(C) functional organisation

(D) line, staff and functional organisation

60. The backbone of any organization is

(A) Information   (B) Employee

(C) Management (D) Capital

61. _____ details are given by management to marketing service system.

(A) Customer

(B) Employee

(C) Supplier

(D) Management and customer

62. Management Information Systems (MIS)

(A) create and share documents that support day-today office activities.

(B) process business transactions (time, payment, orders).

(C) use the transaction data to produce information needed by managers to run the business.

(D) capture and reproduce the knowledge of an expert.

63. Controls of data communication deal with

(A) the communication channel

(B) the computer

(C) terminals

(D) all of these

64. Which of the following is a process theory of motivation ?

(A) Alderfer's ERG theory

(B) Equity theory

(C) Herzberg's two factor theory

(D) McClelland's theory

65. In Locke's (1975) view, goal setting theory is

(A) A replacement for equity theory

(B) A replacement for expectancy theory

(C) A motivational technique rather than a theory of motivation

(D) A replacement of goal theory

Space For Rough Work

SECTION-II

(Each question carries two marks)   **(10 × 2 = 20)**

66. In CPM, the cost slope is determined by

   (A) $\dfrac{\text{Crash cost}}{\text{Normal cost}}$

   (B) $\dfrac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$

   (C) $\dfrac{\text{Normal cost}}{\text{Crash cost}}$

   (D) $\dfrac{\text{Normal cost} - \text{Crash cost}}{\text{Normal time} - \text{Crash time}}$

67. When the dimension is expressed as $20^{+0.035}_{-0.025}$, the tolerance is

   (A) 0.035 mm
   (B) 0.025 mm
   (C) 0.01 mm
   (D) 0.06 mm

68. If 'A' is the total items consumed per year, P is the procurement cost per order and C is the annual inventory carrying cost per item, the most economic order quantity is

   (A) $\dfrac{AP}{C}$ (B) $\dfrac{2AP}{C}$

   (C) $\sqrt{\dfrac{2AP}{C}}$ (D) $\left(\dfrac{AP}{C}\right)^2$

69. If a work content of 10 hrs has to be made at the rate of 400 a week, and the normal working week is 40 hrs, the number of operators required is

   (A) 120
   (B) 100
   (C) 150
   (D) 10

70. If the selected time for element is 0.3 min, the passing rating is 11% and if the sum of all secondary adjustment amounts to 20%, then the standard time will be

   (A) 0.264 min
   (B) 0.327 min
   (C) 0.396 min
   (D) 0.275 min

Space For Rough Work

71. The annual demand for an item is 4000 units. The ordering cost/order is ₹ 150, the inventory holding cost based on average inventory is 20%. The cost per unit is ₹ 5 and the shortage cost based on maximum inventory is 10 paise/unit/year. The EOQ will be

(A) 10 units

(B) 100 units

(C) 1000 units

(D) 10,000 units

72. The variance of the population is 36 and the sample size is 4. The standard error of the sample is

(A) 3

(B) 4

(C) 5

(D) 6

73. A process is to be controlled with standard values of mean = 20 and standard deviation = 6. The sample size is 9. The control limits for $\bar{x}$ chart are

(A) 20 ± 9

(B) 20 ± 4

(C) 20 ± 6

(D) 20 ± 3

74. If the average outgoing quality is 1.5%, the incoming quality at the point of difference will be

(A) 1.5%

(B) 3%

(C) 6%

(D) 5%

75. In a single channel queue, the mean waiting time in the system is 50 min, the mean waiting time in the queue is 30 min, the mean rate of service will be

(A) 3/hr

(B) 2/hr

(C) 1/hr

(D) 50/hr

Space For Rough Work

ME
27
D-1

PART – B
MSE : Manufacturing Science and Engineering
SECTION-I
(Each question carries one mark) (20 × 1 = 20)

46. For fax welding. the pressure desired at the welding torch for oxygen is
    (A) 7 to 103 kN/m²
    (B) 70 to 280 kN/m²
    (C) 200 to 560 kN/m²
    (D) 560 to 840 kN/m²

47. The dip angle of a single point tool is usually.
    (A) 20° to 40°
    (B) 40° to 60°
    (C) 60° to 80°
    (D) 20° to 100°

48. The rake angle required to machine brass by high speed steel tool is
    (A) 0° (B) 10°
    (C) 20° (D) −10°

49. Gear finishing operation is called
    (A) Shaping
    (B) Milling
    (C) Hobbing
    (D) Burnishing

50. Internal gears can be made by
    (A) Hobbing
    (B) Shaping with pinion cutter
    (C) Shaping with rack cutter
    (D) Milling

51. Objective of linear programming for an objective function is to
    (A) Maximize or Minimize
    (B) Subset or proper set modelling
    (C) Row or Column modelling
    (D) Adjacent modeling

52. For a linear programming equations convex set of equations is included in region of
    (A) Feasible solutions
    (B) Disposed solutions
    (C) Profit solutions
    (D) Loss solutions

53. The cutting speed of High speed steels is _____ times faster than carbon steel.
    (A) 2
    (B) 4
    (C) 6
    (D) 8

54. Which of the following cutting conditions greatly affects the tool wear ?
    (A) Cutting speed
    (B) Feed
    (C) Depth of cut
    (D) None of these

55. Robot derived from Czech word
    (A) Rabota (B) Robota
    (C) Rebota (D) Ribota

Space For Rough Work

56. In which of the following operations continuous path system is used ?
   (A) Pick and place
   (B) Loading and Unloading
   (C) Continues welding
   (D) Loading only

57. The degree of closeness of the measured value of a certain quantity with its true value is known as
   (A) Accuracy
   (B) Precision
   (C) Standard
   (D) Sensitivity

58. Error is _____
   (A) True value – Measured value
   (B) Standard value – True value
   (C) Precision value – Measured value
   (D) Measured value – True value

59. For generating coons patch _____ require.
   (A) A set of grid points on surface
   (B) A set of control points
   (C) Circular defining
   (D) Four bounding curves defining surface

60. NC contouring is _____ .
   (A) Point to point positioning
   (B) Absolute positioning
   (C) Continuous path positioning
   (D) Incremental positioning

61. The mode of deformation of the metal during spinning is
   (A) Bending
   (B) Stretching
   (C) Rolling & stretching
   (D) Bending and stretching

62. The parts of circular cross-section which are symmetrical about the axis of rotation are made
   (A) Hot forging
   (B) Hot spinning
   (C) Hot extrusion
   (D) Hot drawing

63. To deliver molten metal from pouring basin to gate, a _____ is used.
   (A) Riser
   (B) Sprue
   (C) Core
   (D) Gateway

64. Green sand is a mixture of
   (A) 30% sand and 70% clay
   (B) 70% sand and 30% clay
   (C) 50% sand and 30% clay
   (D) 90% sand and 10% clay

65. In order to ram the sand harder of the back of the mould and softer on the pattern face a _____ is used.
   (A) Sand slinger
   (B) Squcezing machine
   (C) Jode machine
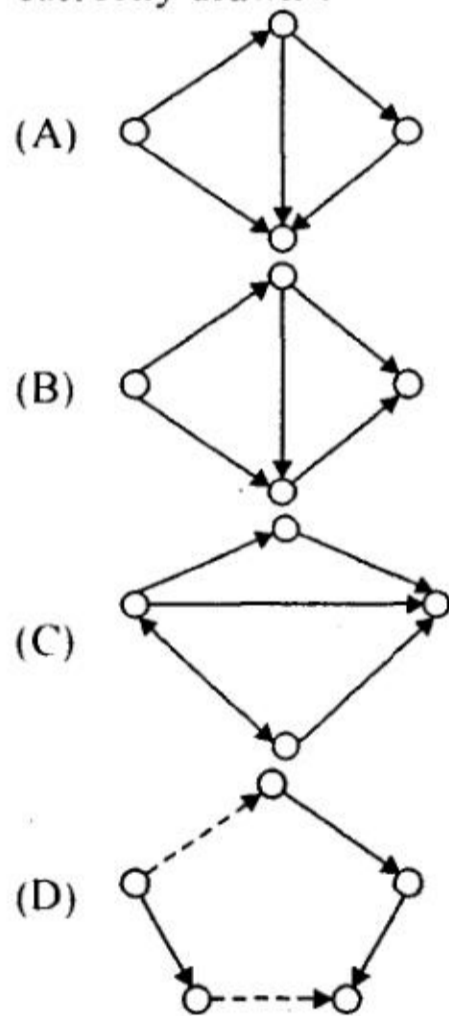   (D) Stripper plate machine

Space For Rough Work

66. "A" is the total items consumed per year. "P" is the procurement cost per order, and "C" is the annual inventory carrying cost per item, then the most economic ordering quantity is given by

(A) $\dfrac{AP}{C}$

(B) $\dfrac{2AP}{C}$

(C) $\sqrt{\dfrac{AP^2}{C}}$

(D) $\left(\dfrac{AP}{C}\right)^2$

67. Which of the following networks is correctly drawn ?

(A)

(B)

(C)

(D)

68. The ascending order of evaluation of materials used for making the cutting tools is

(A) Bronze – Stone – Steel – Iron

(B) Iron – Steel – Bronze – Stone

(C) Stone – Bronze – Iron – Steel

(D) Stone – Bronze – Steel – Iron

69. The stroke of a shaping machine is 250 mm. It makes 30 double strokes per minute. The overall average speed of operation is

(A) 3.75 m/min

(B) 5 m/min

(C) 7.5 m/min

(D) 15 m/min

70. Holes of diameter $25.0^{+0.040}_{+0.020}$ mm are assembled interchangeably with the pins of diameter $25.0^{+0.005}_{-0.008}$ mm. The minimum clearance in the assembly will be

(A) 0.015 mm

(B) 0.0015 mm

(C) 0.001 mm

(D) 0.00105 mm

Space For Rough Work

71. _____ Non-contact inspection method uses a high frequency sound wave ?

(A) Ultrasonic

(B) Ultra – Capacitance

(C) Reluctance

(D) Radiation

72. A triangular facet in a CAD model has vertices : P1 (0, 0, 0); P2 (1, 1, 0); P3(1, 1, 1). The area of the facet is

(A) 0.706

(B) 0.0706

(C) 0.707

(D) 1.707

73. A DC welding power source has a linear voltage – current (V – I) characteristic with open circuit voltage of 80 V and a short circuit current of 300 A. For maximum arc power the current (In amperes) should be set as _____ .

(A) 200

(B) 160

(C) 150

(D) 140

74. When 3–2–1 principle is used to support and locate a three dimensional work-piece during machining, the number of degrees of freedom that are restricted is

(A) 10

(B) 9

(C) 8

(D) 3

75. A bar of square cross section of side "a" is subjected to a tensile load P on a plane inclined at 45° to the axis of the bar, the normal stress will be _____ .

(A) $\dfrac{P}{a^2}$

(B) $\dfrac{P}{2a^2}$

(C) $\dfrac{2P}{a^2}$

(D) $\dfrac{P}{4a^2}$

Space For Rough Work

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