POST GRADUATE COMMON ENTRANCE TEST-2019

DATE and TIME	COURSE	SUBJECT
20-07-2019 **2.30 p.m. to 4.30 p.m.**	**ME/M.Tech/M.Arch/** **courses offered by** **VTU/UVCE/UBDTCE**	**MECHANICAL** **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**
	E	**141741**

DOs :
1. Candidate must verify that the PGCET number & Name printed on the OMR Answer Sheet is tallying with the PGCET number and Name printed on the Admission Ticket. Discrepancy if any, report to invigilator.
2. This question booklet is issued to you by the invigilator after the **2nd bell i.e., after 2.25 p.m.**
3. The Version Code of this Question Booklet should be entered on the OMR Answer Sheet and the respective circle should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. 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 present on the right hand side 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 on the right hand side 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 BALLPOINT PEN against the question number on the OMR answer sheet.**

ಸರಿಯಾದ ಕ್ರಮ **CORRECT METHOD**	ತಪ್ಪು ಕ್ರಮಗಳು WRONG METHODS		
(A) ● (C) (D)	⊗ (B) (C) (D)	(A) (B) (C) ✓	(A) ● ● (D)
	(▲) (B) (C) (D)	(A) ◉ (C) (D)	

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 - E

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

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

1. Navier-Stokes equations are associated with
   - (A) buoyancy
   - (B) turbulence
   - (C) viscosity
   - (D) compressibility

2. In turbulent flow through a pipe of radius R, at what distance from the boundary would the local velocity be equal to the mean velocity ?
   - (A) 0.22 R
   - (B) 0.37 R
   - (C) 0.5 R
   - (D) 0.707 R

3. The absolute zero temperature corresponds to the condition when
   - (A) all the substance exist only as solids
   - (B) volume of the gas reduces to zero
   - (C) kinetic energy of gas reduces to zero
   - (D) no pressure is exerted by the gas

4. By use of cooling, which efficiency of an IC engine decreases ?
   - (A) Volumetric efficiency
   - (B) Mechanical efficiency
   - (C) Charging efficiency
   - (D) Thermal efficiency

5. The stagnation pressure rise in a centrifugal compressor stage takes place in the
   - (A) diffuser only
   - (B) diffuser and impeller
   - (C) impeller only
   - (D) inlet guide vanes.

6. In case of flywheel, the maximum fluctuation of energy is the
   - (A) sum of maximum and minimum energies
   - (B) difference between the maximum and minimum energies
   - (C) ratio of the maximum and minimum energy
   - (D) ratio of the minimum and maximum energy

7. The cam size depends upon
   - (A) pitch circle
   - (B) operating speed of the cam
   - (C) the cam circle enclosing the cam profile
   - (D) base circle

Space For Rough Work

8. Identify the type of vibration induced when the stretched string of a guitar is operated.

   (A) Free longitudinal

   (B) Forced transverse

   (C) Torsional

   (D) Non-linear vibration

9. The selection of the factor safety in design is not dependent upon

   (A) service condition

   (B) nature of load

   (C) material of component

   (D) size of component

10. When a bolt is subjected to shock loads, the failure is likely to occur at

    (A) head

    (B) shank

    (C) threaded

    (D) transition between head and shank

11. Frictional horse power in journal bearing varies

    (A) directly as journal diameter

    (B) directly as square of journal diameter

    (C) directly as cube of journal diameter

    (D) inversely as cube of journal diameter

12. In closed coil helical springs, the angle of helix is less than

    (A) 5 degree   (B) 10 degree

    (C) 15 degree   (D) 20 degree

13. Yellow colour on a pattern indicates

    (A) the seats for loose core prints

    (B) the surface to be left unmachined

    (C) the surface where sand needs to be reinforced

    (D) the surface to be machined

14. High productivity can be achieved by

    (A) employing more men and machines

    (B) giving recognition to trade unions

    (C) adopting proper system of preventive maintenance of machinery

    (D) increasing the working hours.

15. A policy is best defined

    (A) a rule

    (B) a regulation

    (C) a guide to action and decision making

    (D) an unwritten objective

Space For Rough Work

16. Eigen values of the matrix $\begin{matrix} 1 & 1 \\ 1 & 5 \end{matrix}$ are

(A) $\dfrac{3}{2} \pm \sqrt{5}$ (B) $\dfrac{2}{3} \pm \sqrt{5}$

(C) $\dfrac{1}{3} \pm \sqrt{5}$ (D) $\dfrac{1}{2} \pm \sqrt{5}$

17. The material property which depends only on the basic crystal structure is

(A) Fatigue strength

(B) Work hardening

(C) Fracture strength

(D) Elastic constant

18. Which one of the following crystal system is valid for gold ?

(A) Orthogonal (B) Cubic

(C) Hexagonal (D) Triclinic

19. The process of heat treatment is to

(A) relieve the stresses set up in the material after hot or cold working

(B) modify the structure of the material

(C) change the grain

(D) any one of these

20. Which of the composites are dispersion-strengthened composites ?

(A) Particulate composites

(B) Laminar composites

(C) Fiber reinforced composites

(D) Short fiber discontinuous composites

21. A force which combines with two or more forces to produce equilibrium is called

(A) resultant (B) equilibrium

(C) couple (D) moment

22. Resultant of two equal forces is equal to either of them. The angle between the forces is

(A) 0° (B) 60°

(C) 90° (D) 120°

23. The free body diagram of a body shows the body

(A) with its surroundings and external forces acting on it

(B) isolated from all external effects

(C) isolated from surroundings

(D) isolated from surroundings and all external actions acting upon it.

Space For Rough Work

ME
5
E

24. The moment of inertia of a thin disc of mass m and radius r, about an axis through its centre of gravity and perpendicular to the plane of the disc is

(A) $\dfrac{mr^2}{2}$ (B) $\dfrac{mr^2}{4}$

(C) $\dfrac{mr^2}{6}$ (D) $\dfrac{mr^2}{8}$

25. If a beam is subjected to a constant bending moment along its length, then the shear force will

(A) also have a constant value everywhere along its length

(B) be zero at all sections along the beam

(C) be maximum at the centre and zero at the ends

(D) be zero at the centre and maximum at the ends

26. A cantilever beam of rectangular cross section is subjected to a load W at its free end. If the depth of the beam is doubled and the load is halve, the deflection of the free end as compared to original deflection will be

(A) half (B) double

(C) one-eighth (D) one-sixteenth

27. The core of a circular section short column of diameter d is a concentric circular area having a diameter

(A) $\dfrac{d}{4}$ (B) $\dfrac{d}{3}$

(C) $\dfrac{d}{2}$ (D) $\dfrac{d}{8}$

28. Capillary rise and depression

(A) depend solely upon the surface tension of the liquid

(B) are influenced by viscosity of the liquid

(C) depend upon the pressure difference between the liquid and the environment

(D) depend upon surface tension of the liquid as well as the material of the tube

29. The pressure at the bottom of Water Lake is 1.5 times that at half the depth. If the water barometer reads 10m, the depth of lake is

(A) 10 m (B) 15 m

(C) 20 m (D) 25 m

30. Existence of velocity potential implies that the fluid flow is

(A) steady (B) uniform

(C) irrotational (D) in continuum

Space For Rough Work

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

31. Five spark plugs manufactured by ABC company were tested for 40 hours. Two spark plugs failed, one after 10 hours and the other after 25 hours. The mean life of ABC plug is _____

    (A) 36 hours   (B) 60 hours

    (C) 75 hours   (D) 90 hours

32. A reversible engine works between 300 K and 600 K. If the heat supplied to the system is 100 kJ, the work output is

    (A) 200 kJ   (B) 25 kJ

    (C) 50 kJ   (D) 100 kJ

33. A shaft has two heavy rotors mounted on it. The transverse natural frequencies, considering each of the rotor separately, are 100 cycles/s and 200 cycles/s respectively. The lowest critical speed is

    (A) 5367 rpm   (B) 600 rpm

    (C) 9860 rpm   (D) 12000 rpm

34. A fixed gear having 100 teeth meshes with another gear having 25 teeth, the centre lines of both the gear train. The number of rotations made by the similar gear for one rotation of the arm is

    (A) 3   (B) 4

    (C) 5   (D) 6

35. An ocean liner 250 m long has a maximum speed of 15 m/s. To simulate the wave resistance the towing speed of a 10 m long model should be

    (A) 3 m/s   (B) 5 m/s

    (C) 7.5 m/s   (D) 12 m/s

36. Laplace transform of $(t-1)^2$ is

    (A) $\dfrac{2}{S^2} - \dfrac{2}{S} + \dfrac{1}{S}$ (B) $\dfrac{2}{S^3} - \dfrac{2}{S} + \dfrac{1}{S}$

    (C) $\dfrac{1}{S^3} - \dfrac{2}{S} + \dfrac{3}{S}$ (D) $\dfrac{3}{S^3} - \dfrac{1}{S} + \dfrac{7}{S}$

37. If $u = x^3 + y^3 - 3axy$ the value of $\dfrac{\partial^2 u}{\partial x \partial y} = $ _____ u.

    (A) $-3ax$ (B) $-3ay$

    (C) $-3a$ (D) $3a$

Space For Rough Work

38. If $f(x) = xe^x - 2$ and $x_0 = 1$, then $x_1 =$

(A) 0.5679   (B) 0.6679

(C) 0.0579   (D) 0.8679

39. A mechanism has 7 links which are all binary except one which is ternary. The number of instantaneous centres of rotation will be

(A) 14   (B) 21

(C) 28   (D) 42

40. A-50kg block of iron casting at 500 K is thrown into a large lake that is at a temperature of 285 K. The iron block eventually reaches thermal equilibrium with the lake water. Assuming an average specific heat of 0.45 kJ/kg K for the iron, determine the entropy generated during this process.

(A) 16.97 kJ/K   (B) 17.67kJ/K

(C) 15.82 kJ/K   (D) 12.45 kJ/K

41. A body of weight of 10 N is suspended by a string 100 mm long and is held at a point 60 mm from the vertical line passing through the point of suspension by a horizontal force. The horizontal force is

(A) 7.5 N   (B) 10.2 N

(C) 16.7 N   (D) 13.6 N

42. The normal stresses at a points are $\sigma_x = 10$ MPa and $\sigma_y = 2$ MPa, and the shear stress at this points is 4 MPa. The maximum principle stress at this point would be

(A) 16 MPa   (B) 14 MPa

(C) 11 MPa   (D) 20 MPa

43. A solid shaft is subjected to a bending moment of 3.5 kNm and a torsional moment of 11.5 kNm. If the allowable stress for the shaft material is 115 MPa, the shaft diameter based on equivalent bending moment will be

(A) 36 mm   (B) 65 mm

(C) 115 mm   (D) 90 mm

44. The length to radius ratio $\frac{l}{r}$ of a solid cylinder such that the moments of inertia about the longitudinal and transverse axis are equal is

(A) 1   (B) $\sqrt{3}$

(C) $\sqrt{5}$ (D) 2

45. A solid shaft of 40 mm diameter has been substituted by a hollow shaft of external diameter 44 mm and internal diameter of 32 mm. The angles of twist for the hollow and circular shafts will conform to the ratio

(A) 0.30   (B) 0.605

(C) 0.948   (D) 1.22

Space For Rough Work

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

46. Subdivision of end standards is carried out using

(A) Crook's level comparator

(B) Brookes level comparator

(C) Johansson Mikrokator

(D) Sigma electronic comparator

47. In a shaft basis system, the upper deviation of the size of shaft is

(A) 1

(B) less than 0

(C) not related to size

(D) 0

48. The frequency of the stylus movement as it rises up and down the workpiece surface is determined by

(A) the traversing speed

(B) the length of stylus

(C) the curvature of skid

(D) All of these

49. In a p-type semiconductor gauge, as tensile strain increases

(A) gauge resistance decreases

(B) gauge resistance increases

(C) gauge resistance increases and then decreases

(D) there is no effect on gauge resistance

50. Which of the following are functions of operating system ?

(A) Controlling input and output

(B) Scheduling processes

(C) To start the computer operations when power is turned on

(D) All of these

51. Degree of freedom for a robot are

(A) 19

(B) 6

(C) 3

(D) 5

52. The combined transformation are called

(A) Scaling

(B) Reflection

(C) Concatenation

(D) Shear

Space For Rough Work

53. Diesel engines are generally preferred for road transport these days because of low

(A) Initial cost

(B) Manufacturing cost

(C) Prime cost

(D) Operating cost

54. In the fuel injection pumps for Diesel engine the effective pressure strokes of the plungers in the fuel injection pump are regulated by means of a

(A) Fuel pump

(B) Control rack

(C) Needle valve

(D) Camshaft

55. In a Diesel engine the function of a fuel injector is

(A) To mix fuel and air

(B) To ignite air-fuel mixture

(C) To provide flame front for ignition

(D) To spray atomized fuel in the cylinder

56. For flow of petrol from fuel tank to the carburettor, the fuel system includes

(A) An acceleration pump

(B) A vacuum pump

(C) A fuel pump

(D) A suction pump

57. The battery is an electro-chemical device, which means battery

(A) Makes chemicals by mechanical means

(B) Uses chemical action to provide electricity

(C) Has curved plates instead of flat plates

(D) Does not use an electrolyte

58. The correct flow of power through the drive train is

(A) Engine drive shafts, clutch, main shaft, counter shaft, final driven gear, wheels

(B) Engine clutch, main shaft, counter shaft, final driven gear, drive shafts, wheels

(C) Engine clutch, counter shaft, main shaft, final driven gear, drive shafts, wheels

(D) Engine main shaft, counter shaft, clutch, final driven gear, drive shafts, wheels

Space For Rough Work

E

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ME

59. Which one of the given carburetor is a constant vacuum type ?
   (A) Carter carburettor
   (B) S.U. carburettor
   (C) Zenith carburettor
   (D) Solex carburettor

60. What are the basic factors affect the gear selection ?
   (A) Vehicle load and engine speed
   (B) Vehicle speed and engine load
   (C) Vehicle load and road condition
   (D) Engine speed and road condition

61. A vehicle with torsion bar suspension required _____ to take the driving and braking thrust.
   (A) Stabilizer bar
   (B) Pan hard rod
   (C) Radius rod
   (D) Torque tube

62. Choose correct drive transmission from engine to gear box.
   (A) Fly wheel – cover – drive plate – driven plate
   (B) Fly wheel – cover – driven plate – drive plate
   (C) Fly wheel – driven plate – drive plate – cover
   (D) Fly wheel – drive plate – driven plate – cover

63. The shock absorber dissolve can be reduced by pressurizing the fluid with _____ gas.
   (A) Hydrogen
   (B) Nitrogen
   (C) Oxygen
   (D) Carbon dioxide

64. Which among the following springs have the greater energy storing capacity ?
   (A) Coil spring
   (B) Torsion spring
   (C) Leaf spring
   (D) Rubber spring

65. Accuracy is defined as
   (A) a measure of how often an experimental value can be repeated
   (B) the closeness of a measured value to the real value
   (C) the number of significant figures used in a measurement
   (D) None of these

Space For Rough Work

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

66. Single cylinder four stroke engine has brake power of 8 kW and brake mean effective pressure of 0.55 Mpa. What is the length of cylinder which is 1.2 times of bore diameter ? (n = 3000 rpm)

    (A) 110 mm

    (B) 103 mm

    (C) 70 mm

    (D) 65 mm

67. Two springs have spring stiffness of 1500 N/m and 2000 N/m respectively. If they are connected in series, what is the spring stiffness if they are replaced by an equivalent system ?

    (A) 3500 N/m

    (B) 1166 N/m

    (C) 857.63 N/m

    (D) None of these

68. A rotating shaft carries a flywheel which overhangs on the bearing as a cantilever. If the flywheel is reduced to half of its original weight, the whirling speed will

    (A) be double

    (B) increase by $\sqrt{2}$ times

    (C) decrease by $\sqrt{2}$ s times

    (D) be half

69. It is required to measure the effective diameter of a screw using the two-wire method. The distance across 10 threads measured using a scale is 12.5 mm. Determine the size of the best wire for metric threads.

    (A) 0.722 mm

    (B) 0.876 mm

    (C) 0.675 mm

    (D) 0.983 mm

70. A clearance fit has to be provided for a shaft and bearing assembly having a diameter of 40 mm. Tolerances on hole and shaft are 0.006 and 0.004 mm, respectively. The tolerances are disposed unilaterally. If an allowance of 0.002 mm is provided, find the limits of size for hole and shaft when hole basis system is used.

    (A) 45.756 mm

    (B) 39.994 mm

    (C) 32.457 mm

    (D) 55.672 mm

Space For Rough Work

71. In Ideal case, the Charging current for 200Ah battery would be

   (A) 10 A

   (B) 12 A

   (C) 15 A

   (D) 20 A

72. Two mating spur gears have 70 and 30 teeth respectively. Corresponding to a module pitch 5 mm, the centre to centre distance between gears will be

   (A) 125 mm

   (B) 250 mm

   (C) 375 mm

   (D) 500 mm

73. A shaft has an attachment disc at the centre of its length. The disc has its centre of gravity at a distance of 2 mm from the axis of the shaft. When the shaft is allowed to vibrate in its natural frequency of vibration of 10 rad/s. when the shaft is rotated a 300 rev/min. it will whirl with a radius of

   (A) 2 mm

   (B) 2.25 mm

   (C) 2.5 mm

   (D) 3.0 mm

74. In a CAD package, mirror image of a 2D point P (5,10) is to be obtained about a line which passes through the origin and makes of 45° counter clockwise with the X-axis. The co-ordinates of the transformed point will be

   (A) (7.5, 5)

   (B) (10, 5)

   (C) (7.5, –5)

   (D) (10, –5)

75. A piston has allowable tensile stress of 50 N/mm² and has bore diameter 150 mm. Considering strength of piston, what will be the thickness of piston head if maximum pressure of 10 N/mm² acts on it ?

   (A) 29 mm

   (B) 35 mm

   (C) 53 mm

   (D) Insufficient data

Space For Rough Work

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

46. The Hungarian method for solving an assignment problem can also be used to solve

    (A) Transportation problem

    (B) A travelling salesman problem

    (C) LP problem

    (D) Both (A) & (B)

47. The following geometric modelling technique, which one is not a 3D modelling :

    (A) Wire-frame modelling

    (B) Drafting

    (C) Surface modelling

    (D) All of these

48. Which of the following code will give circular interpolation in clockwise direction ?

    (A) G 00

    (B) G 56

    (C) G 69

    (D) G 03

49. Which type of Robot configuration is suitable for pick and place operation ?

    (A) Cartesian

    (B) Cylindrical

    (C) Spherical

    (D) Jointed arm

50. M and E system in metrology are related to measurements of

    (A) screw thread

    (B) flatness

    (C) angularity

    (D) surface finish

51. Which of the following is an interference fit ?

    (A) Push fit

    (B) Running fit

    (C) Sliding fit

    (D) Shrink fit

52. A master gauge is

    (A) New gauge

    (B) an international reference standard

    (C) standard guage for checking accuracy for guages

    (D) a guage used by experienced

Space For Rough Work

53. The heat transferred by conduction, convection and radiation in

(A) melting of ice

(B) boiler furnace

(C) condensation of steam in condenser

(D) None of these

54. The product of Reynold's number and Prandtl number is known as

(A) Stanon number

(B) Biot number

(C) Peclet number

(D) Grashoff number

55. Fouling factor is used

(A) in heat exchanger design as safety factor

(B) in case of Newtonian fluid

(C) when liquid exchanges heat with gas

(D) None of these

56. The maximum number of jets, generally employed in a impulse turbine without jet interference

(A) two

(B) four

(C) six

(D) eight

57. The unit discharge through the turbine is

(A) $\dfrac{Q}{\sqrt{H}}$

(B) $\dfrac{Q}{H}$

(C) $\dfrac{Q}{H^{3/2}}$

(D) $\dfrac{Q}{H^2}$

58. The cavitation in a hydraulic machine is mainly due to

(A) low velocity

(B) high velocity

(C) low pressure

(D) high pressure

Space For Rough Work

59. The impeller of a centrifugal pump may have

  (A)   volute casing

  (B)   volute casing with guide blades

  (C)   vortex casing

  (D)   Any one of these

60. "Scientific Management" is invented by

  (A)   Eton Mayo

  (B)   Henry Fayol

  (C)   F.W. Taylor

  (D)   M.P. Follet

61. The important factor's of hygiene theory are

  (A)   salary

  (B)   working condition

  (C)   Job security

  (D)   All of these

62. The time required for the response to reach 50% of final value in the first attempt is

  (A)   rise time

  (B)   peak time

  (C)   settling time

  (D)   delay time

63. Data acquisition of all the physical quantities in the real world is done in

  (A)   Analog mode

  (B)   Digital mode

  (C)   Analog/Digital mode

  (D)   None of these

64. Which of the following layouts is suitable for mass production ?

  (A)   Process layout

  (B)   Product layout

  (C)   Fixed layout

  (D)   Plant layout

65. A feasible solution to an LP problem

  (A)   must satisfy all the constraints simultaneously

  (B)   need not satisfy all the constraints

  (C)   must be a corner point of the feasible region

  (D)   must optimize the value of the objective function technicians

Space For Rough Work

66. A centrifugal pump with radial vane tips at the outlet has an impeller of 100 mm outer diameter. If the rotative speed is 3000 rpm and manometric efficiency of 0.8, then what is the net head developed ?

(A) 14.2 m

(B) 16.2 m

(C) 20.12 m

(D) 24.12 m

67. Calculate the shaft tolerance and hole tolerance for a pair hole = $50^{+0.5}_{+0.00}$ mm and shaft = $50^{-0.02}_{+0.005}$ mm

(A) Hole tolerance = 0.5 mm

Shaft tolerance = 0.025 mm

(B) Hole tolerance = 0.4 mm

Shaft tolerance = 0.015 mm

(C) Hole tolerance = 0.3 mm

Shaft tolerance = 0.005 mm

(D) Hole tolerance = 0.2 mm

Shaft tolerance = 0.05 mm

68. A local tyre distributor expects to sell 9600 tyres next year. Annual carrying cost is ₹ 16 per tyre and ordering cost is ₹ 75. The economic order quantity of the tyre is

(A) 60

(B) 250

(C) 300

(D) 1000

69. A PERT network has three activities on critical path with mean time 3, 8 and 6 and standard deviations 1, 2 and 2 respectively. The probability that project will be completed in 20 days is

(A) 0.50

(B) 0.66

(C) 0.84

(D) 0.95

70. The inner surface of a plane brick wall is at 60 °C and the outer surface is at 35 °C. Calculate the rate of heat transfer per m^2 of surface area of the wall, which is 220 mm thick. The thermal conductivity of the brick is 0.51 W/m °C.

(A) 52.5 W/m^2

(B) 57.95 W/m^2

(C) 45.23 W/m^2

(D) 42.5 W/m^2

Space For Rough Work

71. The fin parameters are as follows :
Dia. of the fin 2 cm, thermal
conductivity = 200 W/mK, convective
heat transfer coefficient = 12 W/m^{2}K
base temperature of the fin = 500 °C,
Air temperature = 50 °C. The rate of
heat transfer from the fin is

(A) 119.7 watts

(B) 97.93 watts

(C) 57.7 watts

(D) 4.62 watts

72. Assuming the sun to be a black body
emitting radiation with maximum
intensity at $\lambda = 0.49$ μm. Calculate the
surface temperature of the sun.

(A) 3240 K

(B) 3999 K

(C) 5914 K

(D) 5714 K

73. In a power plant steam condenser at a
temperature of 60 °C. The cooling
water enters at 30 °C and leaves at
45 °C. The LMTD of the condenser is

(A) 16.2 °C

(B) 21.6 °C

(C) 30 °C

(D) 37.5 °C

74. A turbine develops 500 kW under a
head of 100 metres at 200 rpm. What
would be it's normal speed, under a
head of 81 metres ?

(A) 130 rpm

(B) 150 rpm

(C) 160 rpm

(D) 180 rpm

75. Three litres of petrol weigh 23.7 N.
Calculate the mass density.

(A) 805 kg/m^3

(B) 809 kg/m^3

(C) 648 kg/m^3

(D) 656 kg/m^3

Space For Rough Work

IPE : INDUSTRIAL & PRODUCTION ENGINEERING
PART – B
(SECTION – I)
Each question carries one mark. (20 × 1 = 20)

46. The wages of supervisors and material handling person are charged as

    (A) overhead

    (B) direct labour cost

    (C) indirect labour cost

    (D) factory cost

47. Which among the following is the last step in magnetic particle test method ?

    (A) Observation and Inspection

    (B) Magnetization

    (C) Circular magnetization

    (D) Demagnetization

48. In radiography test, which region absorbs less radiation and transmits more ?

    (A) Low and high density regions

    (B) High density region

    (C) Low density region

    (D) None

49. In spot welding, the spacing between two spot welds is

    (A) 4 t

    (B) 8 t

    (C) 12 t

    (D) 16 t

50. Which type of heat treatment process used for surface hardening ?

    (A) Normalizing

    (B) Annealing

    (C) Tempering

    (D) Carburizing

51. Continuous chips are formed during metal cutting operation due to

    (A) Ductile work piece

    (B) High rake angle

    (C) High cutting speed

    (D) All of these

Space For Rough Work

52. The coating materials for carbide tools are

(A) TiC, TiN and NaCN

(B) TiC and TiN

(C) Tin, NaCN

(D) TiC and NaCN

53. A shaft and hole pair is designated as $50 \, h_7 d_8$. This assembly constitutes

(A) Interference fit

(B) Transition fit

(C) Clearance fit

(D) None of these

54. An Auto-collimator is used to check

(A) roughness

(B) flatness

(C) angle

(D) balance

55. In VAM method, the basis of allocation is

(A) unit cost penalty

(B) lowest cost

(C) maximum possible quantity

(D) None

56. In an $n \times n$ matrix of an assignment problem, the optimality is reached when the minimum number of straight line scoring all the zero is

(A) n

(B) $\frac{1}{n}$

(C) n^2

(D) None

57. Chance and assignable cause terminology was developed by

(A) Deming

(B) Hawthorne

(C) ISO

(D) Shewhart

58. Which of these is not used for the lot quality inspection purposes ?

(A) EWMA control chart

(B) CWSWM chart

(C) Shewhart control chart

(D) Acceptable sampling

Space For Rough Work

59. Work study is also recognized as

   (A) Time study

   (B) Motion study

   (C) Both (A) and (B)

   (D) None

60. For controlling the rotation through more than 360° we use

   (A) Knob

   (B) Selector

   (C) Crank

   (D) Wheel

61. The system environment in a mainframe computer consists of

   (A) Central processing

   (B) Storage devices

   (C) Printers and Plotters

   (D) Both (A) and (B)

62. NC contouring is an example of

   (A) CP positioning

   (B) PTP positioning

   (C) Absolute positioning

   (D) Incremental positioning

63. In circular drawing process, when the depth of drawing is more than the diameters of die, then the process is called as

   (A) forced drawing

   (B) hollow drawing

   (C) deep drawing

   (D) All of these

64. Which characteristic of material is used in forging process ?

   (A) Elasticity

   (B) Ductility

   (C) Plasticity

   (D) None

65. If a seller recovers his capital along with accumulated interest not in single lump-sum payment but in periodical equal payments over time is based on

   (A) capital recovery annuity

   (B) present worth annuity

   (C) sinking fund annuity

   (D) None

Space For Rough Work

66. A milling cutter of 70 mm diameter with 12 teeth is operating at a cutting speed of 22 m/min and a feed of 0.05 mm / tooth. The feed per minute is

    (A) 110 mm/min

    (B) 35 mm/min

    (C) 6 mm/min

    (D) 60 mm/min

67. Two operators are engaged on a forging machine for producing 25 jobs, each weighing 4 kg in a shift of 8 hrs. They are paid at the rate of ₹ 10 and ₹ 8 per day. The forged material costs ₹ 3.50/kg. Calculate the direct material cost.

    (A) ₹ 350

    (B) ₹ 300

    (C) ₹ 2,000

    (D) ₹ 100

68. A machine costs ₹ 10,000 and its scrap value is estimated as ₹ 2000 after 6 yrs. of useful service. Determine the depreciation fund during 4th year using straight line method.

    (A) ₹ 1,333

    (B) ₹ 1,444

    (C) ₹ 1,666

    (D) ₹ 2,000

69. Grade-I flat has tolerance of

    (A) 0.10 μm

    (B) 0.20 μm

    (C) 0.3 μm

    (D) 0.05 μm

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 and the tolerance on the shaft is 0.04. The maximum clearance (in mm) between hole and shaft is

    (A) 0.04

    (B) 0.05

    (C) 0.10

    (D) 0.11

Space For Rough Work

E   22   ME

71. A brass billet is to be extruded from its initial diameter of 100 mm to a final diameter of 50 mm. The working temperature is 700 °C and the extrusion constant is 250 MPa. The force required for extruding billet is

(A) 544 MN

(B) 2.72 MN

(C) 1.36 MN

(D) 0.36 MN

72. 10 mm dia. holes are to be punched in a steel sheet of 3 mm thickness. Shear strength of material is 400 N/mm² and penetration is 40%. The blanking force is

(A) 22.6 kN

(B) 37.7 kN

(C) 61.6 kN

(D) 94.3 kN

73. In an arc welding process, the voltage and current are 25 V and 300 A respectively. The arc transfer efficiency is 85% and welding speed is 8 mm/sec. The net heat in J/mm is

(A) 64

(B) 797

(C) 1103

(D) 79700

74. In orthogonal cutting, the cutting force 900 N and thrust force = 600 N and chip sheer angle is 30°. The shear force is

(A) 1080 N

(B) 970 N

(C) 480 N

(D) 70 N

75. In a machining operation, doubling the cutting speed reduces the tool life to $1/8^{th}$ of the original value. The exponent 'n' in Taylor's tool life equation $VT^n = C$ is

(A) $\frac{1}{8}$

(B) $\frac{1}{4}$

(C) $\frac{1}{3}$

(D) $\frac{1}{2}$

Space For Rough Work

IEM : INDUSTRIAL ENGINEERING AND MANAGEMENT

PART – B

(SECTION – I)

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

46. The database environment has all of the following components, except :
    (A) users
    (B) separate files
    (C) database
    (D) DBA

47. Set of all entities having same attributes is classified as
    (A) Entity type
    (B) Attribute type
    (C) Function type
    (D) Hierarchy type

48. In transportation models designed in LPP, points of demand is classified as
    (A) ordination
    (B) transportation
    (C) destinations
    (D) origins

49. The critical activity has
    (A) maximum float
    (B) minimum float
    (C) zero float
    (D) None

50. Raw materials and WIP can be classified as
    (A) Indirect material
    (B) Direct material
    (C) Semi-finished material
    (D) Finished material

51. VMI stands for
    (A) Vendor Material Inventory
    (B) Vendor Managed Inventory
    (C) Variable Material Inventory
    (D) None

52. CAD/CAM refers to
    (A) Science and Engineering
    (B) Manufacturing
    (C) Design and Manufacturing
    (D) Design and Marketing

53. In CNC systems multiple microprocessors and PLC work
    (A) in parallel
    (B) in series
    (C) one after others
    (D) None

54. Internal state sensors are used for measuring
    (A) position
    (B) position and velocity
    (C) velocity and acceleration
    (D) position, velocity and acceleration

Space For Rough Work

E

24

ME

55. What is the effect of wear on the size of 'G0' snap gauges ?

(A) Decrease

(B) Increase

(C) Increase or decrease

(D) No effect

56. Johansson mickrocator is a type of

(A) mechanical comparator

(B) optical comparator

(C) electrical comparator

(D) pneumatic comparator

57. The work study is done using

(A) planning chart

(B) process chart

(C) stop watch

(D) Any one of these

58. Most frequently used components are arranged in

(A) left side   (B) right side

(C) central location (D) none

59. The process standard deviation is given by

(A) $\bar{R}/d_2$ (B) $\bar{R}d_2$

(C) $1/d_2$ (D) $\bar{R}/d$

60. The percent of the sample means will have values that are within $\pm 3\sigma$ of the distribution mean is

(A) 95.5   (B) 96.7

(C) 97.6   (D) 99.7

61. Sequential sampling plan is an extension of

(A) Single sampling plan

(B) Double sampling plan

(C) Multiple sampling plan

(D) 0% sampling

62. Military type of organization is also known as

(A) line organization

(B) line, staff and functional organization

(C) line and staff organization

(D) functional organization

63. Two factor theory is based on which factors ?

(A) Hygiene and behavioural

(B) Safety and self esteem

(C) Self actualisation

(D) None

64. The flow of information through MIS is

(A) Organization dependent

(B) Need dependent

(C) Information dependent

(D) Management dependent

65. In MIS system design the sources of information may be categorized as _____ and _____.

(A) internal, external

(B) useful, un-useful

(C) personal, organizational

(D) constructive, destructive

Space For Rough Work

66. If $2 = x_1 + x_2$ is subjected to constraints $x_1 + x_2 \leq 1$, $-3x_1 + x_2 \leq 3$ and $x_1 \leq 0$, $x_2 \geq 0$, then the maximum value of z occurs at

    (A) $\left(\frac{1}{2}, \frac{1}{2}\right)$

    (B) $(0, 5)$

    (C) $(1, 0\cdot5)$

    (D) Infeasible solution

67. When the ordering cost is increased to 16 times the EOQ will be increased to

    (A) 2

    (B) 8

    (C) 4

    (D) None

68. A shaft has a dimension of $35 \, {}^{-0.009}_{-0.025}$ mm. The respective values of fundamental deviation and tolerances are

    (A) $-0.025, \pm 0.008$

    (B) $-0.025, 0.016$

    (C) $-0.009, \pm 0.008$

    (D) $-0.009, 0.016$

69. G0 dimensions of a plug gauge using unilateral system for gauging 75 ± 0.05 mm diameter hole is by assuming 10% work tolerance are

    (A) $74.955 \, {}^{+0.010}_{-0.00}$ mm

    (B) $74.955 \, {}^{+0.015}_{-0.01}$ mm

    (C) $74.955 \, {}^{+0.0010}_{-0.00}$ mm

    (D) $74.955 \, {}^{+0.5}_{-0.1}$ mm

70. The correct order of method study is

    (A) Select – Record – Examine – Develop – Define – Install – Maintain

    (B) Select – Define – Examine – Develop – Record – Install – Maintain

    (C) Select – Record – Develop – Examine – Define – Install – Maintain

    (D) Select – Record – Examine – Define – Develop – Install – Maintain

Space For Rough Work

71. An item is made in lots of 200 each. The lots are 100% inspected. For the first 25 lots inspected a total number of defective items are 75. The percent defective $\bar{P}$ is

(A) 0.15
(B) 0.015
(C) 1.5
(D) 0.0015

72. The process standard deviation is 0.1368 and the LSL = 2.00, WSL = 3. What will be the value of process capability ?

(A) 1.6
(B) 1.323
(C) 1.218
(D) 1.648

73. Calculate the producers risk for a given sampling plan having Pa = 0.809 at AQL = 1%.

(A) 1.91%
(B) 11.9%
(C) 10.9%
(D) 19.1%

74. The order cost of an inventory is ₹ 400 with an annual carrying cost of ₹ 10/unit. The EOQ for an annual demand of 2000 units is

(A) 400
(B) 440
(C) 480
(D) 520

75. A PERT network has three activities on a critical path with mean time 3, 8 and 6 and σ = 1, 2 and 2 respectively. The probability that the project will be completed in 20 days is

(A) 0.50
(B) 0.66
(C) 0.84
(D) 0.95

Space For Rough Work

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

46. Which of the following sensors determines the relationship of the robot and it's environment and the objects handled by it ?
   (A) Internal state sensor
   (B) External state sensor
   (C) Both (A) and (B)
   (D) None of these

47. In which of the following robot operation continues path system is used ?
   (A) Pick and Place
   (B) Loading & Unloading
   (C) Continue welding
   (D) All of these

48. Which device mostly associated with automation ?
   (A) Flexible manufacturing
   (B) Robots
   (C) Computer graphics
   (D) CNC machine

49. Interpolator in a CNC machine
   (A) Controls spindle speed
   (B) Co-ordinate axis movements
   (C) Operates tool changer
   (D) Commands canned cycle

50. In computer aided drafting practice an arc is defined by
   (A) Two end points
   (B) Centre and radius
   (C) Radius and one end point
   (D) Two end points & centre

51. In NC – machine tool the position feedback system is interfaced between
   (A) control unit and programmer
   (B) programmer & machine tool
   (C) control unit and machine tool
   (D) programmer and process planning

52. Optical flats are made of
   (A) Quartz   (B) Plastic
   (C) Glass   (D) Steel

53. In tolerance specification 25D6, the letter 'D' represents
   (A) Guage tolerance
   (B) Upper deviation
   (C) Lower deviation
   (D) Type of fit

54. The feeler guage is used to measure
   (A) Pitch of the screw
   (B) Surface roughness
   (C) Thickness of clearance
   (D) Flatness of surface

Space For Rough Work

55. Queuing theory is associated with
   (A) Inventory
   (B) Sales
   (C) Waiting time
   (D) Production time

56. PERT analysis is based on :
   (A) optimistic time
   (B) pessimistic time
   (C) most likely time
   (D) All of these

57. The spindle speed range in a general purpose lathe is divided into steps based on the following series :
   (A) Arithmetic progression
   (B) Geometric progression
   (C) Harmonic progression
   (D) Logarithmic progression

58. Which one of the following is not a synthetic abrassive material ?
   (A) Silicon carbide
   (B) Aluminium oxide
   (C) Titanium nitride
   (D) Cubic boron nitride

59. Flank wear mainly occurs on
   (A) nose part, front relief face and side relief face
   (B) nose part and top face
   (C) cutting edges
   (D) All of these

60. The increase in hardness due to cold working is called
   (A) cold hardening (B) hot hardening
   (C) work hardening (D) age hardening

61. In rolling operation the maximum draft is given by
   (A) μR (B) $\mu\sqrt{R}$
   (C) $\mu^2 R^2$ (D) $\mu^2 R$

62. The current in an electric resistance welding can be regulated by
   (A) varying the input supply
   (B) changing the primary turns
   (C) changing the secondary turns
   (D) Any of these

63. In TIG welding, the welding zone is shielded by
   (A) Helium gas
   (B) Argon gas
   (C) Either (A) or (B)
   (D) None of these

64. Oxyacetalyne gas used in gas welding to produce a flame temperature of
   (A) 1800 °C (B) 2100 °C
   (C) 2400 °C (D) 3200 °C

65. An industrial robot is specified by
   (A) pay load
   (B) work envelop
   (C) degree of freedom
   (D) All of these

Space For Rough Work

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

66. Up to what size can wires be drawn by wire drawing process ?

(A) 0.01 mm

(B) 0.02 mm

(C) 0.03 mm

(D) 0.04 mm

67. Which of the following represents muscles of a robot ?

(A) Actuators

(B) Power supply

(C) Microcontroller

(D) Robotic arm

68. In CNC system multiple – microprocessors and programmable logic controllers work

(A) in parallel

(B) in series

(C) (A) or (B)

(D) None of these

69. Dimension of a hole is $50^{-0.00}_{-0.00}$ mm and shaft is $50^{-0.00}_{-0.02}$ mm the minimum clearance is

(A) 0.02 mm

(B) 0.00 mm

(C) – 0.02 mm

(D) 0.01 mm

70. Maximize $z = 15\,x_1 + 20\,x_2$

Subjected to

$12\,x_1 + 4\,x_2 \geq 36$

$12\,x_1 - 6\,x_2 \leq 24$

$x_1, x_2 \geq 0$

The above linear programming problem has

(A) Infeasible solution

(B) Unbounded solution

(C) Alternate optimum solution

(D) Degenerate solution

Space For Rough Work

71. If there are m sources and n destination in a transportation matrix the total number of basic variables in a basic feasible solution is

(A) $m + n$

(B) $m + n + 1$

(C) $m + n - 1$

(D) m

72. Calculate the power required for a machining of a work piece on a lathe having efficiency of 85% on full load, when the tangential force is 1200 N and cutting speed is 195 m/min.

(A) 4.59 kW

(B) 275.3 W

(C) 3.3 kW

(D) None of these

73. Using Taylor equation where $n = 0.5$ and $c = 120$, calculate the percentage increase in tool life when the cutting speed is reduced by 50%.

(A) 100%

(B) 200%

(C) 300%

(D) 400%

74. For machining mild steel using HSS tool the average cutting speed is

(A) 5 m/min

(B) 10 m/min

(C) 15 m/min

(D) 30 m/min

75. The shear strength of sheet metal is 300 MPa. Calculate the blanking force required to produce a blank of 100 mm diameter from a 1.5 mm thick sheet is

(A) 45 kN

(B) 70 kN

(C) 141 kN

(D) 3500 kN

Space For Rough Work