

POST GRADUATE COMMON ENTRANCE TEST-2016

DATE and TIME	COURSE	SUBJECT
03-07-2016 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
		B - 1
		215514

DOs :

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 X 1 = 30 (Section 2) 15 Questions : 15 X 2 = 30
 PART-B : (Section 1) 20 Questions : 20 X 1 = 20 (Section 2) 10 Questions : 10 X 2 = 20

PROJECT REPORT

Sl. No.	Name of the Student	Roll No.
1	ABHIRAM K. S.	19BCE0123
2	ADARSH K. S.	19BCE0124
3	ADITHYAN K. S.	19BCE0125
4	ADITHYAN K. S.	19BCE0126
5	ADITHYAN K. S.	19BCE0127
6	ADITHYAN K. S.	19BCE0128
7	ADITHYAN K. S.	19BCE0129
8	ADITHYAN K. S.	19BCE0130
9	ADITHYAN K. S.	19BCE0131
10	ADITHYAN K. S.	19BCE0132

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MECHANICAL SCIENCES

PART – A

(Common to AE/MC/IPE/IEM/MSE)

SECTION – I

(Each question carries one mark.)

(30 × 1 = 30)

1. Addition of chromium in iron results the steel
 - (A) More ductile
 - (B) Refine grain structure
 - (C) Increase the critical range of temperature and moves the eutectoid point to the left
 - (D) All of the above
2. The residual stress reduce due to hardening can be relieved by
 - (A) Stress relieving process
 - (B) Tempering
 - (C) Drawing
 - (D) All of the above
3. For the two shafts connected in parallel, find which statement is true
 - (A) Torque in each shaft is the same
 - (B) Shear stress in each shaft is the same
 - (C) Angle of twist of each shaft is the same
 - (D) Torsional stiffness of each shaft is the same
4. The shear stress distribution over a rectangular cross-section of a beam follows
 - (A) A straight line path
 - (B) A circular path
 - (C) A parabolic path
 - (D) An elliptical path
5. If the value of Poisson's ratio is zero it means that
 - (A) The material is rigid
 - (B) The material is perfectly plastic
 - (C) There is no longitudinal strain in the material
 - (D) None of these
6. Reynolds number for pipe flow is given by
 - (A) vD/u
 - (B) vD/δ
 - (C) $vD\rho/\mu$
 - (D) vD/μ
7. When the water flows over a rectangular suppressed weir, the pressure beneath the nappe is
 - (A) Very high
 - (B) Slightly above atmospheric
 - (C) Atmospheric
 - (D) Negative

Space For Rough Work

8. Speed of a submarine can be measured by
(A) Pitot tube
(B) Hot wire anemometer
(C) Pirani gauge
(D) Inclined manometer
9. The rate of change of linear momentum is equal to
(A) Active force
(B) Reactive force
(C) Torque
(D) Work done
10. A system comprising of a single phase is known as,
(A) Open system
(B) Closed system
(C) Homogeneous system
(D) Heterogeneous system
11. In IC engines, the power developed inside the cylinder is known as
(A) Brake horse power
(B) Indicated horse power
(C) Pumping power
(D) None of these
12. A gas turbine cycle with heat exchanger and reheating improves
(A) Only the thermal efficiency
(B) Only the specific power output
(C) Both thermal efficiency and specific power output
(D) Neither thermal efficiency nor specific power output
13. The curve traced by the end of a thread as it is unwound from a stationary cylinder is known as
(A) Circle (B) Cycloid
(C) Epicycloid (D) Involute
14. The gear train usually employed in clocks is a
(A) Reverted gear train
(B) Simple gear train
(C) Sun and planet gear
(D) Differential gear
15. In a 4-stroke I.C. engine the turning moment during the compression stroke is
(A) Positive throughout
(B) Negative throughout
(C) Positive during major portion of the stroke
(D) Negative during major portion of the stroke

Space For Rough Work

16. For self locking which of the following condition is satisfied ?
- (A) $\Phi \geq \alpha$
 - (B) $\Phi \leq \alpha$
 - (C) Both (A) and (B)
 - (D) None of these
17. In designing a plate clutch, assumption of uniform wear conditions is made because
- (A) It is closer to real life situation
 - (B) It leads to a safer design
 - (C) It leads to cost effective design
 - (D) No other assumption is possible
18. In Involute gears, the pressure angle is
- (A) Dependent on the size of teeth
 - (B) Dependent on the size of gears
 - (C) Always constant
 - (D) Always variable
19. The most suitable material for die casting is
- (A) Steel (B) Cast iron
 - (C) Nickel (D) Copper
20. Negative Rake angles are used for
- (A) Heavy loads
 - (B) Carbide tools
 - (C) Hard materials
 - (D) All of the above
21. The control chart pattern
- (A) Loop (B) Cycle
 - (C) Trend (D) All the three
22. The chart that represents quantitative data about the movements of workers, materials or equipment between any number of places over any given period of time is
- (A) Gantt chart
 - (B) Cumulative sum chart
 - (C) Travel chart
 - (D) Flow chart
23. In a $n \times n$ matrix of an assignment problem, the optimality is reached when the minimum number of straight line scoring all the zeros is
- (A) n^2
 - (B) $1/n$
 - (C) n
 - (D) None of the above
24. Motivation – Hygiene theory was developed by
- (A) Fredrick Herzber
 - (B) Maslow
 - (C) F.W Taylor
 - (D) Mc. Gregor

Space For Rough Work

25. For a vector function $\vec{F}$ $\text{div } \vec{F} = 0$ then $\vec{F}$, is called _____

- (A) Irrotational
- (B) Conservative
- (C) Solenoidal
- (D) Rotational

26. The Maclaurin's series expansion of e^x is _____

- (A) $1 + x + x^2 / 2! + x^3 / 3! + \dots$
- (B) $1 + x - x^2 / 2! + x^3 / 3! + \dots$
- (C) $x - x^2 / 2! + x^3 / 3! + \dots$
- (D) None of these

27. Lagrange's mean value theorem is a special case of _____.

- (A) Rolle's theorem
- (B) Cauchy's mean value theorem
- (C) Taylor's theorem
- (D) Taylor's series

28. $\int_0^1 \int_{x^2}^{2-x} xy \, dx \, dy$ is equal to _____

- (A) $3/4$
- (B) $3/8$
- (C) $3/5$
- (D) $3/7$

29. The toughness of mild steel under uniaxial tensile loading is given by the area under the stress strain curve upto

- (A) Proportional limit
- (B) Yield point
- (C) Ultimate stress
- (D) Fracture

30. Case hardening of low carbon steel

- (A) Increase ductility and toughness in the core effectively
- (B) Decrease ductility and toughness in the core effectively
- (C) Ductility and toughness in the core remain unaltered
- (D) None of the above

Space For Rough Work

SECTION-II

(Each question carries two marks)

(15 × 2 = 30)

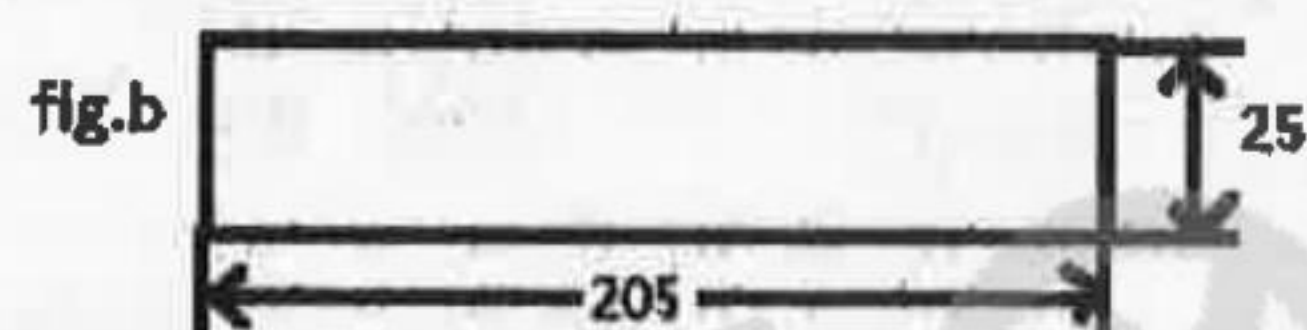
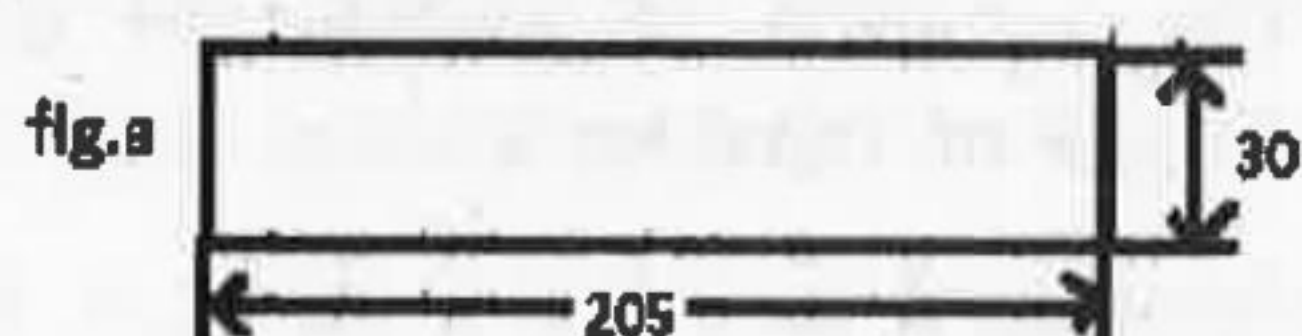
31. When a column is fixed at both ends, corresponding Euler's critical load is
(A) $(\pi^2 EI) / L^2$
(B) $(2\pi^2 EI) / L^2$
(C) $(3\pi^2 EI) / L^2$
(D) $(4\pi^2 EI) / L^2$
32. Pressure force on the 15 cm diameter headlight of an automobile travelling at 0.25 m/s is
(A) 10.4 N
(B) 6.8 N
(C) 4.8 N
(D) 3.2 N
33. In a reversible adiabatic process, the ratio of T_1/T_2 is equal to
(A) $(P_1/P_2)^{\gamma-1/\gamma}$
(B) $(P_2/P_1)^{\gamma-1/\gamma}$
(C) $(V_1/V_2)^{\gamma-1/\gamma}$
(D) $(V_2/V_1)^{\gamma-1/\gamma}$
34. Efficiency of the Carnot cycle is given by
(A) $(T_1 + T_2) / T_1$
(B) $(T_1 - T_2) / T_1$
(C) $T_1 / (T_1 + T_2)$
(D) $T_1 / (T_1 - T_2)$
35. There are six gears A, B, C, D, E, F in a compound train. The number of teeth in the gears are 20, 60, 30, 80, 25 and 75 respectively. The ratio of the angular speeds of the driven (F) to the driver (A) of the drive is
(A) 1/24 (B) 1/8
(C) 4/15 (D) 12
36. The equation of motion for a single degree of freedom system with viscous damping $4 \ddot{x} + 9 \dot{x} + 16 x = 0$. The damping ratio of the system is
(A) 9/128 (B) 9/16
(C) $9/8\sqrt{2}$ (D) 9/8
37. The frictional torque for square thread at mean radius while raising load is given by (W = load, R_m = mean radius, Φ = angle of friction, α = helix angle)
(A) $WR_m \tan(\Phi - \alpha)$
(B) $WR_m \tan(\Phi + \alpha)$
(C) $WR_m \tan \alpha$
(D) $WR_m \tan \Phi$
38. In flat belt drive, if the slip between the driver and the belt is 1% and between belt and follower is 3%. If driver and follower pulley diameters are equal then the velocity ratio of the drive will be
(A) 0.99 (B) 0.98
(C) 0.97 (D) 0.96

Space For Rough Work

39. For casting Aluminum cube of sides 15 cm. The volume of shrinkage of Aluminium during solidification is 6.5%. If cylindrical top riser is used then, what will be diameter of cylindrical riser ?

- (A) 18 cm (B) 21 cm
(C) 25 cm (D) 24 cm

40. Fifty flat pieces 1 mm thick and initial dimensions as shown in Fig. (a) are to be milled in a single cut to final dimensions shown in Fig. (b) using end milling. If the cutter of diameter 25 mm has 10 teeth and rotates at 100 rpm find the material removal rate.



- (A) $35.7 \text{ mm}^3/\text{s}$
(B) $37.7 \text{ mm}^3/\text{s}$
(C) $41.7 \text{ mm}^3/\text{s}$
(D) $47.7 \text{ mm}^3/\text{s}$

41. A carbide tool with mild steel work piece was found to give life of 2 hours while cutting at 50 m/min. Assume $VT^{0.27} = C$. Calculate the tool life if the same tool is used at a speed 25% higher than the previous one.

- (A) 40.05 min
(B) 45.05 min
(C) 49.05 min
(D) 52 min

42. Four forces, P, 2P, 3P and 4P act along the sides taken in order of a square. The resultant force is

- (A) Zero
(B) $2\sqrt{2}P$
(C) $2P$
(D) $\sqrt{5}P$

43. A body of mass 10 kg moving with a velocity of 1 m/s is acted upon by a force of 50 N for two seconds. The final velocity is,

- (A) 22 m/s
(B) 1 m/s
(C) $\sqrt{21} \text{ m/s}$
(D) 11 m/s

44. The ratio of moment of inertia of a circular body about X axis to that about Y axis is

- (A) 0.5
(B) 1.0
(C) 1.5
(D) 2.0

45. 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 a same material and the same outside diameter is

- (A) 15/16
(B) 3/4
(C) 1/2
(D) 1/16

Space For Rough Work

PART – B
AE : Automobile Engineering
SECTION-I
(Each question carries one mark)

(20 × 1 = 20)

46. The dynamo in an automobile
- (A) Converts mechanical energy into chemical energy
 - (B) Continuously recharge the battery
 - (C) Act as a reservoir of electrical energy
 - (D) Supplies electric power
47. For a vibrating system, if the damping factor is unity, then the system is
- (A) Under damped
 - (B) Over damped
 - (C) Critically damped
 - (D) Zero damped
48. The secondary critical speed of a shaft occurs at
- (A) Half the primary critical speed
 - (B) Twice the primary critical speed
 - (C) Four times the primary critical speed
 - (D) None of the above
49. The assumption of viscous damping in practical vibrating system is
- (A) One of reality
 - (B) To make the resulting differential equation linear
 - (C) To make the resulting differential equation non linear
 - (D) To make the response of the mass linear with time
50. When one end of the helical spring is fixed and the other end carries a load W , which moves with SHM, the frequency of motion is given by
- (A) $\frac{1}{2\pi} \sqrt{\frac{\delta}{g}}$
 - (B) $\frac{1}{2\pi} \sqrt{\frac{g}{\delta}}$
 - (C) $2\pi \sqrt{\frac{\delta}{g}}$
 - (D) $2\pi \sqrt{\frac{g}{\delta}}$
51. In designing a connecting rod it is assumed that
- (A) Both ends are hinged for buckling about x axis
 - (B) Both ends are fixed for buckling about y axis
 - (C) One end fixed and other end hinged
 - (D) Both (A) and (B) above

Space For Rough Work

52. Crank pin is designed on the basis of
- (A) Bending stress
 - (B) Bearing stress
 - (C) Shear stress
 - (D) Bending stress and shear stress
53. Piston slap can be avoided if the top diameter of the piston is kept
- (A) Larger
 - (B) Smaller
 - (C) Equal
 - (D) Any one of the above
54. Which of the following is determined by an hydrometer ?
- (A) Specific gravity of gases
 - (B) Relative humidity
 - (C) Specific gravity of liquids
 - (D) Specific gravity of solids
55. The instrument used to measure the flow of air around an aeroplane
- (A) Anemometer
 - (B) Venturimeter
 - (C) Orifice meter
 - (D) Rotameter
56. _____ is a digital transducer.
- (A) Encoder
 - (B) Photovoltaic
 - (C) Piezoelectric transducer
 - (D) Thermocouple
57. Which of the following can be measured with the help of a piezoelectric crystal ?
- (A) Acceleration
 - (B) Temperature
 - (C) Velocity
 - (D) Flow
58. CAE and CAM are linked through
- (A) Common database and communication system
 - (B) NC tape programming and automated design
 - (C) Assembly automation and tool production
 - (D) Parts production and testing
59. Automation means
- (A) Increased productivity
 - (B) Workers controlling productivity
 - (C) Assisting and replacing humans by machines
 - (D) All of the above

Space For Rough Work

60. The voltage developed to strike spark in the spark plug is in the range

- (A) 6 – 12 V
- (B) 1000 – 2000 V
- (C) 20000 – 25000 V
- (D) None of the above

61. Cetane number of the fuel used commercially for diesel engine in India is in the range

- (A) 80 to 90
- (B) 60 to 80
- (C) 60 to 70
- (D) 40 to 45

62. The method used for governing in petrol engine is

- (A) Quality governing
- (B) Hit and miss governing
- (C) Quantitative governing
- (D) Partial governing

63. An engine indicator is used to determine

- (A) Temperature
- (B) MEP and IP
- (C) Speed
- (D) Volume of cylinder

64. Cetane number is the measure of

- (A) Viscosity of fuel
- (B) Ignition Quality
- (C) Calorific value of fuel
- (D) Auto ignition temperature

65. Which of the following types of car batteries are generally used in India ?

- (A) Lead acid battery
- (B) Dry battery
- (C) Nickel cadmium battery
- (D) Nickel iron battery

Space For Rough Work

SECTION-II

(Each question carries two marks.)

(10 × 2 = 20)

66. For the following "Matching" exercise choose the correct one :

Group - 1	Group - 2
i. Marine diesel engine	1. 2 stroke engine
ii. Air conditioning	2. 4 stroke engine
iii. Steam power plant	3. Rotary engine
iv. Gas turbine power plant	4. Cooling and dehumidification
	5. Cooling tower
	6. Brayton cycle
	7. Rankine cycle
	8. D-slide valve

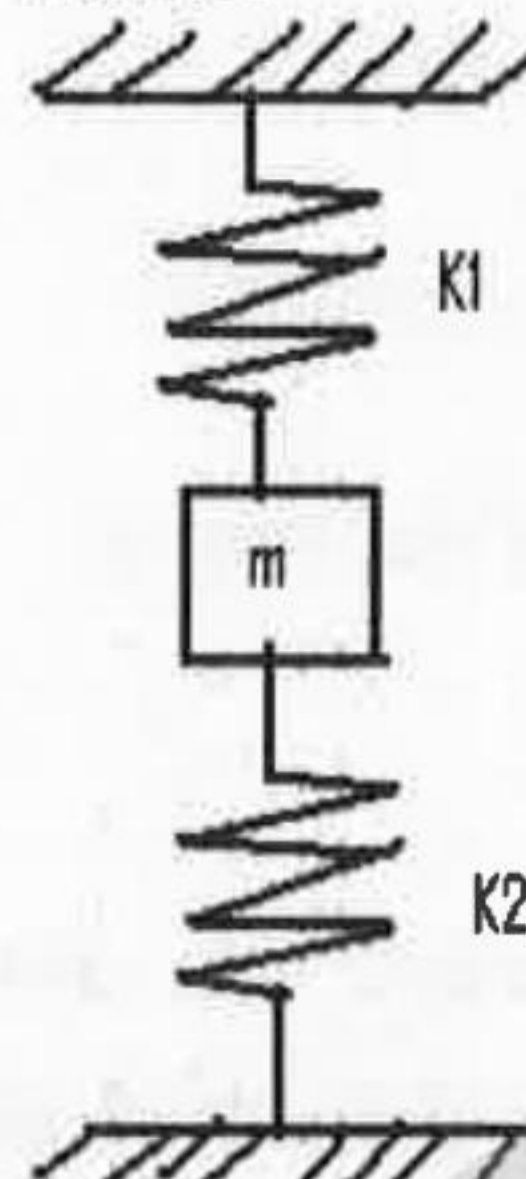
Codes :

	i	ii	iii	iv
(A)	3	5	7	2
(B)	4	6	8	1
(C)	5	2	3	4
(D)	2	5	6	8

67. The earth can be assumed as a uniform sphere. Suppose the earth shrinks by 1% in diameter, then new day period

- (A) Not change from 24 hrs
(B) Reduce by about 2%
(C) Reduce by about 1%
(D) Increase by about 1%

68. The equivalent spring stiffness given in the figure will be



- (A) $K_1 K_2 / (K_1 + K_2)$
(B) $K_1 + K_2$
(C) $1 / (K_1 + K_2)$
(D) $(K_1 + K_2) / K_1 K_2$

69. Match List I with List II and select the correct answer from the codes given below the :

List - I	List - II
i. Surface profilometer	1. Calibration
ii. Light spectron microscope	2. Form sector
iii. Mikro kator x	3. Film thickness measurement
iv. Interferometer	4. Centre line average
	5. Comparator

Codes :

	i	ii	iii	iv
(A)	1	2	3	5
(B)	4	3	1	5
(C)	3	4	1	5
(D)	4	3	5	1

Space For Rough Work

70. An Ottocycle operates with volume of 40 cm^3 and 400 cm^3 at top dead centre and bottom dead centre. If the power output is 100 kW, what is the heat input, in kJ/s ?

Assume $\gamma = 1.4$

- (A) 166
- (B) 145
- (C) 110
- (D) 93

71. Match List – I with List – II and select the correct answer from the codes given below the lists :

List – I

List – II

- | | |
|-------------------------------|-----------------------------|
| i. Pre combustion chamber | 1. Compression Swirl |
| ii. Turbulent chamber | 2. Masked inlet valve |
| iii. Open combustion chamber | 3. Spark ignition |
| iv. F-head combustion chamber | 4. Combustion induced swirl |
| | 5. M-Chamber |

Codes :

- | | i | ii | iii | iv |
|-----|---|----|-----|----|
| (A) | 4 | 5 | 3 | 2 |
| (B) | 1 | 3 | 5 | 2 |
| (C) | 2 | 3 | 1 | 5 |
| (D) | 4 | 1 | 2 | 3 |

72. Match List I with List II and select the correct answer from the codes given below the lists :

List – I

List – II

- | | |
|--|------------------|
| i. One of the simplest of pressure voltage transducer uses a _____ | 1. Vibration |
| ii. Angular velocity can be measured with the help of a _____ | 2. Absorption |
| iii. Seismic accelerator may also be used as _____ sensor. | 3. Tachometer |
| iv. _____ dynamometer works on the principle that the power measured is converted into heat by friction or by other means. | 4. Potentiometer |

Codes :

- | | i | ii | iii | iv |
|-----|---|----|-----|----|
| (A) | 2 | 3 | 4 | 1 |
| (B) | 3 | 4 | 2 | 1 |
| (C) | 4 | 3 | 1 | 2 |
| (D) | 1 | 2 | 3 | 4 |

Space For Rough Work

73. Match List – I with List – II and select the correct answer from the codes given below the lists :

List – I		List – II	
i. _____ is the instrument used for measuring angle relative to the horizontal plane.		1. Auto-collimator	
ii. _____ is the instrument used for measuring small angular deflection.		2. Clinometers	
iii. The _____ is a simple form of mechanical measuring device.		3. Comparator	
iv. _____ is an instrument used for comparing the dimensions.		4. Spirit level	

Codes :

	i	ii	iii	iv
(A)	1	2	3	4
(B)	2	1	4	3
(C)	3	4	1	2
(D)	4	1	2	3

74. An IC engine has a bore and stroke of 2 units each. The area to calculate heat loss can be taken as

- (A) 4π
(B) 5π
(C) 6π
(D) 8π

75. Item given in List – I with List – II pertain to gas analysis. Match List – I with List – II and select the correct answer using the codes given below the Lists :

List – I		List – II	
i. CO_2		1. Alkaline pyrogallol	
ii. Orsat apparatus		2. KOH solution	
iii. CO		3. Wet Analysis	
iv. O_2		4. Ammonical	
		5. Dry Analysis	

Codes :

	i	ii	iii	iv
(A)	2	3	1	4
(B)	1	3	2	4
(C)	1	5	4	2
(D)	2	5	4	1

Space For Rough Work

PART - B
MC : Mechanical Engineering
SECTION-I

(Each question carries one mark)

(20 × 1 = 20)

- | | |
|--|---|
| <p>46. The probability distribution of activity times in PERT follows following distribution.
(A) Normal (B) Binomial
(C) Beta (D) Exponential</p> <p>47. Pessimistic time is
(A) The maximum time in which an activity might require
(B) The average time required for a job
(C) The most probable time considering all conditions
(D) The earliest finish</p> <p>48. The capital and running costs of similar machines having unequal services life can be compared by
(A) Present network method
(B) Rate of return method
(C) Equivalent annual cost method
(D) Depreciation method</p> <p>49. Product layout is employed for
(A) Batch production
(B) Continuous production
(C) Effective utilization of machine
(D) All of the above</p> <p>50. A Bourdon tube pressure gauge is used for measuring _____ pressures.
(A) Low
(B) High
(C) High as well as low
(D) None of the above</p> | <p>51. If the flow is irrotational as well as steady, it is known as
(A) Non-uniform flow
(B) One dimensional flow
(C) Potential flow
(D) None of the above</p> <p>52. In case of laminar flow, the loss of pressure head is proportional to
(A) Velocity
(B) Velocity²
(C) Velocity³
(D) None of the above</p> <p>53. In centrifugal pumps, cavitation is reduced by
(A) Increasing the flow velocity
(B) Reducing the discharge
(C) Throttling the discharge
(D) Reducing the section head</p> <p>54. The hot wire anemometer used for measuring gas velocities is a
(A) Variable resistance transducer
(B) Variable capacitance transducer
(C) Variable frequency transducer
(D) Variable inductance transducer</p> <p>55. How can hysteresis error in Bourdon tube be minimized ?
(A) By calibrating it regularly
(B) By selecting the material properly
(C) By avoiding direct entry of steam into it
(D) By using them well within the designed pressure range</p> |
|--|---|

Space For Rough Work

56. For better results a strain gauge should have low
 (A) Resistance value
 (B) Gauge factor
 (C) Resistance temperature coefficient
 (D) All of the above
57. On a drawing, the surface roughness is represented by
 (A) Curves (B) Triangles
 (C) Circles (D) Square
58. Term used to represent the recycling of unused memory is
 (A) Garbage collection
 (B) Diagnostic routine
 (C) Direct memory access
 (D) Memory dump
59. Four different types of CAD tools that can be used in IC design are, geometric, symbolic, procedural and
 (A) Cell base (B) Assembly
 (C) Open loop (D) Logic
60. Grashoff number is expressed by
 (A) $\frac{\text{Inside diameter of tube}}{\text{Equivalent thickness of film}}$
 (B) $\frac{\text{Thermal conductivity}}{\text{Equivalent thickness of film}}$
 (C) $\frac{\text{Inertia force} \times \text{Buoyant force}}{\text{Viscous force}}$
 (D) $\frac{\text{Specific heat} \times \text{viscosity}}{\text{Thermal conductivity}}$
61. Total emissivity of polished silver compared to black body is
 (A) Higher
 (B) More or less same
 (C) Very much lower
 (D) Very much higher
62. Which of the following is expected to have highest thermal conductivity ?
 (A) Steam
 (B) Solid ice
 (C) Water
 (D) Boiling water
63. The ratio of energy absorbed by the body to total energy falling on it is called
 (A) Absorptive power
 (B) Emissive power
 (C) Absorptivity
 (D) None of the above
64. A graphical device used to determine the break-even point and profit potential under varying conditions of output and costs is
 (A) Gantt chart
 (B) Flow chart
 (C) Break-even chart
 (D) PERT chart
65. The performance of a specific task in CPM is known as
 (A) Dummy
 (B) Event
 (C) Activity
 (D) None of the above

Space For Rough Work

SECTION-II

(Each question carries two marks)

(10 × 2 = 20)

66. The value of Prandtl number for air is about

- (A) 0.1
- (B) 0.3
- (C) 0.7
- (D) 1.7

67. According to Rawan plan, if H = hourly rate, A = Actual time and S = Standard time, then wages will be

- (A) HA
- (B) $HA + \left(\frac{S-A}{S}\right) HA$
- (C) $HA + \left(\frac{S-A}{2}\right) H$
- (D) $HA + \left(\frac{S-A}{S}\right) H$

68. A dummy activity

- (A) Is artificially introduced
- (B) Is represented by a dotted line
- (C) Does not require any time
- (D) All of the above

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

- | List - I | List - II |
|---------------|-----------------------|
| a. Draft tube | 1. Impulse Turbine |
| b. Surging | 2. Reciprocating pump |
| c. Air vessel | 3. Reaction turbine |
| d. Nozzle | 4. Centrifugal pump |

Codes :

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

70. Match List-I with List-II and select the correct answer from the codes given below the lists.

- | List - I | List - II |
|-----------------------------|-------------------------------|
| a. Surface profilometer | 1. Calibration |
| b. Light section Microscope | 2. Comparator |
| c. Microkater | 3. Film thickness measurement |
| d. Interferometer | 4. Centre line average |

Codes :

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

Space For Rough Work

71. In a forecasting model, at the end of period 13, the forecasted value for period 14 is 75. Actual value in the periods 14 to 16 are constant at 100. If the assumed simple exponential smoothing parameter is 0.5, then the MSC at the end of period 16 is
- (A) 820.31
 - (B) 273.44
 - (C) 43.75
 - (D) 14.58
72. The penalty cost is four times that of carrying cost for an item, and the demand rate is constant. If shortages are permitted, the service level that could be maintained at EOQ ordering is
- (A) 0.75
 - (B) 0.80
 - (C) 1.25
 - (D) 1.33
73. A Turbine develop 8000 kW when running at 100 rpm. The head on the turbine is 36 m. If the head is reduced to 9 m, the power developed by the turbine will be
- (A) 16,000 kW
 - (B) 4,000 kW
 - (C) 1,414 kW
 - (D) 1000 kW
74. Two plates spaced 150 mm apart are maintained at 1000 °C and 70 °C. The heat transfer will take place mainly by
- (A) Convection
 - (B) Free convection
 - (C) Forced Convection
 - (D) Radiation
75. If the temperature of a solid surface changes from 27 °C to 627 °C, then its emissive power changes in the ratio of
- (A) 3
 - (B) 6
 - (C) 81
 - (D) 27

Space For Rough Work

PART – B
IPE : Industrial and Production Engineering
SECTION-I

(Each question carries one mark)

(20 × 1 = 20)

- | | |
|---|---|
| <p>46. The Father of scientific management is
(A) F.W. Taylor
(B) Gilbreth. B.
(C) Henry Fayol
(D) Russell Roff</p> <p>47. The sub division of an operation into therbligs and their analysis is known as
(A) Work study
(B) Time study
(C) Micro motion study
(D) None of these</p> <p>48. Residual method is a type of
(A) Radiographic testing
(B) Leak test
(C) Magnetic particle testing
(D) None of these</p> <p>49. Example of NDT is
(A) Transonic test
(B) Magnetic particle test
(C) Liquid dye reentrant test
(D) All of the above</p> | <p>50. The ultimate solution to the CAD/CAM problem will be
(A) LANs
(B) The microprocessor
(C) Turnkey systems
(D) Development of a more efficient display controller</p> <p>51. Digitizer which measures a wave travelling at the speed of sound is
(A) Electrostatic
(B) Sonic
(C) Digitizing scanner
(D) Capacitative</p> <p>52. Which of the following charts is used as a control chart for attributes ?
(A) X-chart
(B) R-chart
(C) S-chart
(D) C-chart</p> |
|---|---|

Space For Rough Work

53. The device attached at the end of the Robot's wrist is called

- (A) Sensor
- (B) End effector
- (C) Manipulator
- (D) Encoder

54. The cutting velocity in m/sec, for turning a work piece of diameters 100 mm at spindle speed of 480 rpm is

- (A) 1.26
- (B) 2.51
- (C) 48
- (D) 151

55. Turning produces

- (A) Square shape
- (B) Triangular shape
- (C) Cylindrical shape
- (D) All of the above

56. In metal cutting operation the approximate ratio of heat distributed among chip, tool and work, in that order is

- (A) 80 : 10 : 10
- (B) 33 : 33 : 33
- (C) 20 : 60 : 10
- (D) 10 : 10 : 80

57. Hot-die forging is also known as

- (A) Isothermal forging
- (B) Hull forging
- (C) Precision forging
- (D) Embossing

58. Which of the following metals is best suitable for extrusion either hot or cold ?

- (A) Zinc
- (B) Magnesium
- (C) Copper
- (D) Aluminum

59. Roll piercing is used to produce

- (A) Cooking pot
- (B) Seamless tube
- (C) Railroad rail
- (D) Crank shaft

Space For Rough Work

60. The scale plan or model on which a thread is used to trace and measure the path of workers, material or equipment during a specified sequence of events is called

- (A) Travel chart
- (B) Simo chart
- (C) String diagram
- (D) Layout

61. MTM Association suggests that MTM 100 equals

- (A) BSI 83
- (B) BSI 100
- (C) BSI 93
- (D) BSI 60

62. The standard tolerance unit is equal to

- (A) $0.45\sqrt[3]{D} + 0.001 D$
- (B) $0.45\sqrt[4]{D} + 0.001 D$
- (C) $0.45\sqrt[3]{D} + 0.01 D$
- (D) $0.45\sqrt[4]{D} + 0.01 D$

63. Optical flats are made of

- (A) Quartz
- (B) Glass
- (C) Plastic
- (D) Steel

64. The disadvantage of using North-West corner rule to find initial solution to the transportation problem is that

- (A) It leads to degenerate initial solution
- (B) It is complicated to use
- (C) It does not take into account the cost of transportation
- (D) All of the above

65. The optimality of a transportation problem is determined by the application of

- (A) North-West corner rule
- (B) Row minima method
- (C) Vogel's approximation method
- (D) Stepping stone method

Space For Rough Work

SECTION-II

(Each question carries two marks)

(10 × 2 = 20)

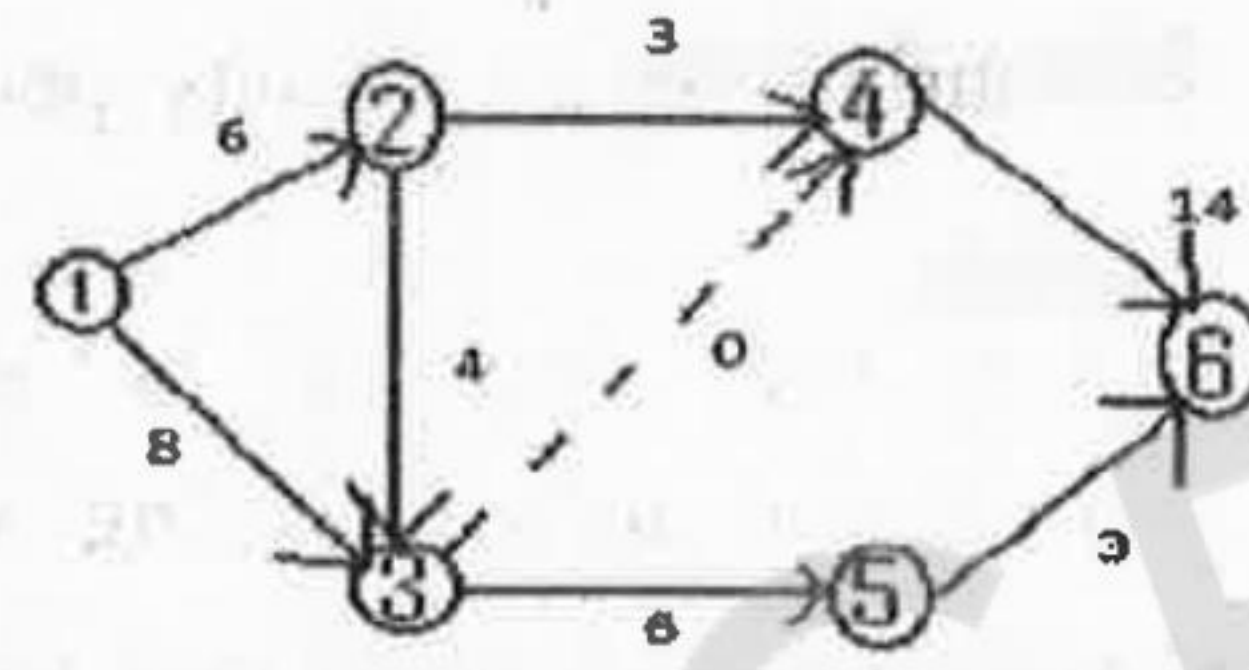
66. In weaving operation, the parameter to be controlled is the number of defects per 10 square yards of material. Control chart approximate for this task is

- (A) P – chart
- (B) C – chart
- (C) R-chart
- (D) X-chart

67. Suppose X is a normal random variable with mean 0 and variance 4. Then the mean of the absolute value of X is

- (A) $\frac{1}{\sqrt{2\pi}}$
- (B) $\frac{2\sqrt{2}}{\sqrt{\pi}}$
- (C) $\frac{2\sqrt{2}}{\pi}$
- (D) $\frac{2}{\sqrt{\pi}}$

68. For the network shown in the figure, the variance along the critical path is 9. The probability of completion of the project in 24 days is



- (A) 68.2%
- (B) 84.1%
- (C) 95.4%
- (D) 50%

69. 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 infeasible region
- (D) Only the interior points in the feasible region

70. A single sampling plan is as follows :
 $n = 60$, $N = 1000$, the probability of acceptance of the lot at 1% defective is 0.8. The ATI of the plan is

- (A) 248
- (B) 260
- (C) 240
- (D) 280

Space For Rough Work

71. A process is said to be controlled with standard values of mean = 18 and the standard deviation is equal to 4. The sample size is 9. The control limits for x-chart are

- (A) 18 ± 9 (B) 18 ± 6
(C) 18 ± 4 (D) 18 ± 3

72. In a contouring or continuous path CNC system

- (A) Slides can move to a pre-programmed location along one axis at a time.
(B) Slide motion in more than one axis is controlled continuously and simultaneously.
(C) Inter polators are not used.
(D) Slides have continuous motion along one axis at a time.

73. A boiler was purchased for ₹ 45,000 on 1st January, 1946. The erection and installation work cost ₹ 7,000. The boiler was replaced by a new one on 31st December, 1965. If the scrap value was estimated at ₹ 15,000, the depreciation value of boiler per year using straight line method would be

- (A) ₹ 1,350 (B) ₹ 1,530
(C) ₹ 1,580 (D) ₹ 1,850

74. Which of the following pairs of process and draft is correctly matched?

- (i) Rolling – 2
(ii) Extrusion – 50
(iii) Forging – 4

Select the correct answer using the codes given below

Codes :

- (A) (i), (ii) and (iii)
(B) (i) and (ii)
(C) (i) and (iii)
(D) (ii) and (iii)

75. Stroke of a shaping machine is 250 mm. It takes 30 double strokes per minute, overall average speed of operation is

- (A) 3.75 m/min
(B) 5.00 m/min
(C) 7.5 m/min
(D) 15 m/min

Space For Rough Work

PART – B
IEM : Industrial Engineering and Management
SECTION-I

(Each question carries one mark)

(20 × 1 = 20)

46. For grade IT7, value of tolerance is equal to
(A) 8i
(B) 10i
(C) 16i
(D) 24i
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. The output device used in conjunction with a computer – aided design system is
(A) Light pen
(B) Joy stick
(C) Electrostatic plotters
(D) Tracker ball
49. Which of the following are cursor control devices ?
(A) Thumb co heel
(B) Joy stick
(C) Track ball
(D) All of the above
50. In MTM one TMU is equal to
(A) 0.0006 minutes
(B) 0.0008 minutes
(C) 0.0005 min
(D) 0.0009 min
51. The symbol used for operation in process chart is
(A)  (B) 
(C)  (D) 
52. The micro motion study involves how many number of fundamental hand motions ?
(A) 12 (B) 14
(C) 15 (D) 16
53. In PERT analysis a critical activity has
(A) Maximum float
(B) Zero float
(C) Maximum cost
(D) Minimum cost
54. In MRP system, component demand is
(A) Forecasted
(B) Established by the master production schedule
(C) Calculated by the MRP system from the master production schedule
(D) Ignored

Space For Rough Work

55. A feeler gauge is used to check
(A) Radius
(B) Screw pitch
(C) Surface roughness
(D) Thickness of clearance
56. What does the abbreviation DBMS stand for ?
(A) Database manipulation software
(B) Digital base mapping system
(C) Data Borrowing and movement software
(D) Database management system
57. For taking decisions data must be
(A) Very accurate
(B) Massive
(C) Collected from diverse sources
(D) Processed correctly
58. Limitation of linear programming models are based on criteria of
(A) Additivity (B) Divisibility
(C) Deterministic (D) All of these
59. The analysis, which depends upon the value of inventory processed by the firm, rather than what has been consumed or used, is known as
(A) XYZ analysis (B) VED analysis
(C) HML analysis (D) FSN analysis
60. A Gantt chart provides information about
(A) Sales
(B) Inventory
(C) Machine utilization
(D) Production schedule
61. F.W. Taylor introduced a system of working known as
(A) Line organization
(B) Line and staff organization
(C) Functional organization
(D) Committee organization
62. In this type of sampling, the lot will be judged by the two or more samples drawn at different interval of time.
(A) Single sample plan
(B) Double sampling plan
(C) Sequential sampling plan
(D) Internal sampling plan
63. The control chart used for measuring variability, when the sample size is large, is
(A) P-chart
(B) C-chart
(C) U-chart
(D) S-chart
64. In the simplex method, the variables which have not been assigned the value zero, during iterations, are called as
(A) Basic variable
(B) Artificial variable
(C) Actual variable
(D) None of the above.
65. Scarce items are
(A) Mostly available in indigenous market
(B) Cannot be procured early
(C) Of short supply or imported items
(D) All of the above

Space For Rough Work

SECTION-II

(Each question carries two marks)

(10 × 2 = 20)

66. The mean and variance of consumption of an item are 100 and 16. The area under normal curve for $Z = 2$ is 0.95. The Recorder point (ROP) for 95% service will be

- (A) 92
- (B) 100
- (C) 108
- (D) None of the above

67. The least count of a metric vernier caliper having 25 division on vernier scale, matching with 24 divisions of main scale (1 main scale = 0.5 mm) is

- (A) 0.05 mm
- (B) 0.01 mm
- (C) 0.02 mm
- (D) 0.001 mm

68. A single sampling plan uses a sample size of 15, and an acceptance number of 1; using hyper geometric probabilities, the probability of acceptance of lots of 50 articles with 2% defective is

- (A) 0.1
- (B) 1
- (C) 0.98
- (D) 0.01

69. The monthly sales is ₹ 2000. Annual carrying cost is ₹ 2400. The ordering cost per order is ₹ 600. The EOQ is

- (A) One month sales
- (B) Two month sales
- (C) Three month sales
- (D) Four month sales

Space For Rough Work

70. Balls of diameter 30 mm and 15 mm were used to measure the taper of a ring gauge. During inspection the ball of 30 mm diameter was protruding by 2.5 mm above the top surface of the ring. This surface was located at a height of 50 mm from the top of the 15 mm diameter ball. The taper angle is
- (A) 19.2°
(B) 1.92°
(C) 29.1°
(D) 21°
71. A random sample of 10 is to be taken from a lot of 120 pieces 12 of which are defective. The probability of 3 defective is
- (A) 0.184
(B) 0.061
(C) 0.015
(D) 0.001
72. In a linear programming model there are 4 decision variables and 3 constraints. During an iteration, by simplex method, the co-efficient of base variables would form
- (A) An identity matrix
(B) Slack variables
(C) Basic solution
(D) Null matrix
73. Annual demand for a part is 6000 units; production capacity of the plant is 1000 units. If the optimum batch size is 1,000. Then maximum inventory level will be
- (A) 2,000 units
(B) 1,000 units
(C) 500 units
(D) 3,000 units
74. The sub-group size is 20. The standard deviation of the sub-groups is 5, 7, 6, 4, 6, 7, 5, 4, 5, 7. The upper control limit for a sigma chart is
- (A) 1.856
(B) 4.856
(C) 6.344
(D) 8.344
75. A PERT activity has an optimistic time of three days, pessimistic time of 15 days and expected time is 7 days. The most likely time of the activity is
- (A) 5 days
(B) 6 days
(C) 7 days
(D) 9 days

Space For Rough Work

PART – B
MSE : Manufacturing Science and Engineering
SECTION-I

(Each question carries one mark)

(20 × 1 = 20)

46. In a transfer line
(A) The workstations must form a close loop
(B) All the machine tools must be automatic
(C) All the machine tools must be of conventional and general purpose type
(D) Cycle time taken is the total time taken by all the machining operations
47. Feed drives in CNC machines are provided by
(A) Unidirectional motors
(B) Servo motors
(C) Synchronous motors
(D) Stepper motors
48. Critical path on PERT / CPM chart is obtained by joining the events having
(A) Maximum slack
(B) Minimum slack
(C) Average slack
(D) Judgement and experience
49. The probability distribution of project completion in PERT follows the distribution
(A) Normal (B) Binomial
(C) Beta (D) Exponential
50. The smallest increment of motion at the wrist end that can be controlled by the robot is called
(A) Spatial resolution
(B) Accuracy
(C) Repeatability
(D) None of the above
51. Commonly used flux for brazing is
(A) NH_4Cl (B) Borax
(C) Soft Iron (D) Soft silver
52. In blanking operation, the force on the punch depends upon
(A) Sheet thickness
(B) Clearance
(C) Diameter of punch
(D) All of the above
53. The quickest type of chuck for centering operation is
(A) Three jaw
(B) Four jaw
(C) Pneumatic chuck
(D) Magnetic chuck
54. Weld decay is the phenomenon found with
(A) Cast iron
(B) Mild steel
(C) Non ferrous materials
(D) Stainless steel

Space For Rough Work

55. Machining centre is a
(A) NC machine tool
(B) Transfer machine tool
(C) Group of automatic machine tools
(D) Next logical step beyond NC machine
56. The maximum amount by which the measurement result differs from the true value is called
(A) Correction
(B) Error
(C) Accuracy
(D) Uncertainty
57. The dimensioning system in which all coordinates are measured from a fixed datum is called
(A) Absolute dimensioning
(B) Incremental dimensioning
(C) Chain dimensioning
(D) None of the above
58. The geometric modeling which give clear view about all requirements of object is called
(A) Surface modeling
(B) Solid modeling
(C) Wire frame modeling
(D) None of the above
59. In medal making the type of sheet metal operation employed is
(A) Drawing (B) Sizing
(C) Coining (D) Rolling
60. The machining operation of cutting a keyway inside a drilled hole is known as
(A) Reaming (B) Broaching
(C) Boring (D) Tapping
61. Negative rakes are used for
(A) Heavy load
(B) Harder material
(C) Carbide tools
(D) All of the above
62. The cutting force is affected by
(A) Feed, depth of cut and speed
(B) Cutting tool angle
(C) Material hardness
(D) (A) and (C) above
63. Which of the following is not direct reading type measuring instrument ?
(A) Telescopic gauge
(B) Micrometer
(C) Bevel Protractor
(D) Dial gauge
64. Dynamometer is a transducer used to measure
(A) Angular motion
(B) Pressure
(C) Torque
(D) Linearity
65. Metal extrusion process is generally used for producing
(A) Uniform solid sections
(B) Uniform hollow sections
(C) Uniform solid and hollow sections
(D) Varying solid and hollow sections

Space For Rough Work

SECTION-II

(Each question carries two marks)

(10 × 2 = 20)

66. The ductility of a material with work hardening

- (A) Increases
- (B) Decreases
- (C) Remains unaffected
- (D) Unpredictable

67. In an interchangeable assembly, shafts

of size $25^{+0.040}_{-0.010}$ mm mate with holes of

size $25^{+0.020}_{-0.000}$ mm. The maximum

possible clearance in the assembly will be

- (A) 10 microns
- (B) 20 microns
- (C) 30 microns
- (D) 60 microns

68. A welding operation is time-studied during which an operator was pace-rated as 120%. The operator took, on an average, 8 minutes for producing the weld joint. If a total of 10% allowances are allowed for this operation, the expected standard production rate of the weld joint (in units per 8 hour day) is

- (A) 45
- (B) 50
- (C) 55
- (D) 60

69. A cylinder of 155 mm is to be reduced to 150 mm diameter in one turning cut with a feed of 0.15 mm/rev. and a cutting speed of 150 m/min on a NC lathe. The programmed spindle speed is

- (A) 998 rpm
- (B) 308 rpm
- (C) 120 rpm
- (D) 606 rpm

Space For Rough Work

70. In a typical metal cutting operation using a cutting tool of positive rake angle of 10° , it was observed that the shear angle was 20° . The friction angle is

- (A) 45°
- (B) 30°
- (C) 60°
- (D) 40°

71. In a PTP control NC machine the slides are positioned by an integrally mounted stepper motor drive. If the specification of the motor is 1° / pulse, and the pitch of the lead screw is 3.6 mm, what is the expected positioning accuracy ?

- (A) $1\ \mu\text{m}$
- (B) $10\ \mu\text{m}$
- (C) $50\ \mu\text{m}$
- (D) $100\ \mu\text{m}$

72. Forging of steel is done at a temperature of

- (A) 400°C
- (B) 800°C
- (C) 1000°C
- (D) 1300°C

73. In a linear programming model there are four decision variables and three constraints. During an iteration, by simplex method, the coefficient of the base variables would form

- (A) An identity matrix
- (B) Slack variables
- (C) Basic solution
- (D) None of the above

74. Welding of C40 steel plate of 10 mm thickness required a current of 160 amps, while it was 360 amps when the plate thickness was increased by 50%. The required welding current for 8 mm thickness of the same material is

- (A) 102.4 amps
- (B) 280 amps
- (C) 153.4 amps
- (D) 212.7 amps

75. In an orthogonal machining operation, the chip thickness and the uncut thickness are equal to 0.45 mm. If the tool rake angle is 0° , the shear plane angle is

- | | |
|----------------|----------------|
| (A) 45° | (B) 30° |
| (C) 18° | (D) 60° |

Space For Rough Work

Space For Rough Work



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