

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET SERIES

TEST BOOKLET
WORKSHOP SUPERINTENDENT (POLYTECHNIC)



Time Allowed : 2 Hours]

[Maximum Marks : 100

All questions carry equal marks.

INSTRUCTIONS

1. Immediately after the commencement of the examination, you should check that test booklet does not have any unprinted or torn or missing pages or items, etc. If so, get it replaced by a complete test booklet.
2. Encode clearly the test booklet series A, B, C or D as the case may be in the appropriate place in the answer sheet.
3. Write your Roll Number only in the box provided alongside.
Do not write anything else on the Test Booklet.
4. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). Choose only one response for each item which you consider the best.
5. After the candidate has read each item in the Test Booklet and decided which of the given responses is correct or the best, he has to mark the circle containing the letter of the selected response by blackening it completely with Black or Blue ball pen. In the following example, response "C" is so marked :
6. Do the encoding carefully as given in the illustrations. While encoding your particulars or marking the answers on answer sheet, you should blacken the circle corresponding to the choice in full and no part of the circle should be left unfilled.
7. You have to mark all your responses ONLY on the ANSWER SHEET separately given according to 'INSTRUCTIONS FOR CANDIDATES' already supplied to you. Responses marked on the Test Booklet or in any paper other than the answer sheet shall not be examined.
8. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. There will be no negative marking.
9. Before you proceed to mark responses in the Answer Sheet fill in the particulars in the front portion of the Answer Sheet as per the instructions sent to you.
10. After you have completed the test, hand over the Answer Sheet only, to the Invigilator.

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1. Which of the following coal has the highest calorific value ?
(A) Anthracite (B) Bituminous
(C) Lignite (D) Peat
2. In binary vapour cycle :
(A) Mercury is used in the bottoming cycle
(B) Steam is used in topping cycle
(C) Mercury is used in topping cycle
(D) Either mercury or steam is used in topping cycle
3. The thermal efficiency of a gas turbine with regenerator is maximum when pressure ratio is :
(A) less than 1.3 (B) more than 1.0
(C) equal to 1.0 (D) zero
4. Deaeration of feed water in a Rankine vapour cycle is carried out because it reduces :
(A) Cavitation of boiler feed pumps
(B) Corrosion caused by oxygen
(C) Heat transfer coefficient
(D) pH value of water

5. Morse test is used to determine :
- (A) Indicated power for multicylinder engines
 - (B) Shaft power
 - (C) Mean effective pressure
 - (D) Temperature of the exhaust gases
6. Lean mixture in an automobile is required during :
- (A) Idling
 - (B) Starting
 - (C) Accelerating
 - (D) Cruising
7. Precise petrol injection system is :
- (A) Direct injection
 - (B) Sequential injection
 - (C) Throttle body injection
 - (D) Port injection
8. Mist lubrication is mainly used in :
- (A) Four-stroke petrol engine
 - (B) Four-stroke diesel engine
 - (C) Two-stroke petrol engine
 - (D) Wankel engine

9. In compound compression system with intercooling in a refrigeration cycle the suction vapour to the second stage of compression is :
- (A) Superheated (B) Wet
(C) Dry saturated (D) Subcooled
10. Iso-octane content in a fuel for S.I. engines :
- (A) retards auto-ignition
(B) accelerates auto-ignition
(C) does not affect auto-ignition
(D) none of the above
11. The efficiency of a Carnot engine is 0.75. If the cycle is reversed, its coefficient of performance as heat refrigerator is :
- (A) 0.25 (B) 0.53
(C) 1.33 (D) 4

12. In electrolux refrigerator :

- (A) Ammonia is absorbed in hydrogen
- (B) Ammonia is absorbed in water
- (C) Ammonia evaporates in hydrogen
- (D) Hydrogen evaporates in ammonia

13. A simple saturated refrigeration cycle has the following state points, enthalpy after compression = 425 kJ/kg, enthalpy after throttling = 125 kJ/kg, enthalpy before compression = 375 kJ/kg. The COP of cycle will be :

- (A) 5
- (B) 3.5
- (C) 6
- (D) 10

The process of removing moisture from air at constant dry bulb temperature is known as :

- (A) Sensible heating
- (B) Sensible cooling
- (C) Humidification
- (D) De-humidification

15. The process of maintaining the speed of a steam turbine constant for various load conditions is known as :
- (A) Reheating (B) Bleeding
(C) Governing (D) Cooling
16. A composite wall consists of three different materials having thermal conductivity k , $2k$ and $4k$ respectively. The temperature drop across different materials will be in the ratio :
- (A) 1 : 1 : 1 (B) 1 : 2 : 4
(C) 4 : 2 : 1 (D) 2 : 4 : 1
17. A 30 mm OD pipe is to be insulated with asbestos having a thermal conductivity of 0.1 W/mK . The convective heat transfer coefficient is $5 \text{ W/m}^2/\text{K}$. The critical radius of insulation for this pipe would be :
- (A) 10 mm (B) 20 mm
(C) 40 mm (D) 60 mm

18. A counter flow heat exchanger, the hot fluid is cooled from 110°C to 80°C by a cold fluid which gets heated from 30°C to 60°C . LMTD for heat exchanger is :
- (A) 80°C (B) 50°C
(C) 30°C (D) 20°C
19. The temperature of a solid surface is raised from 227°C to 727°C , the emissive power of the body will change from E_1 to E_2 such that E_2/E_1 is :
- (A) 400 (B) 16
(C) 4000 (D) 1600
20. The ratio of modulus of rigidity to bulk modulus for a Poisson's ratio of 0.25 would be :
- (A) $2/3$ (B) $2/5$
(C) $3/5$ (D) 1.0
21. A cold rolled steel shaft is designed on the basis of maximum shear stress theory. The principal stresses induced at its critical section are 60 MPa and -60 MPa respectively. If the yield stress for the shaft material is 360 MPa , the factor of safety of the design is :
- (A) 2 (B) 3
(C) 4 (D) 5

22. A laminated spring 1 m long carries a central point load of 2000 N. The spring is made of plates each 5 cm wide and 1 cm thick. The bending stress in the plates is limited to 10 N/mm^2 . The number of plates required will be :
- (A) 3 (B) 5
(C) 6 (D) 8
23. A simply supported beam of span (l) carries a point load (W) at the centre of the beam. The shear force diagram will be :
- (A) a rectangle
(B) a triangle
(C) two equal and opposite rectangles
(D) two equal and opposite triangles
24. The torque transmitted by a solid shaft of diameter 40 mm if the shear stress is not to exceed 400 N/cm^2 , would be :
- (A) $1.6 \times \pi \text{ N-m}$ (B) $16\pi \text{ N-m}$
(C) $0.8 \times \pi \text{ N-m}$ (D) $0.4 \times \pi \text{ N-m}$

25. If the diameter of a long column is reduced by 20%, the percentage of reduction in Euler's buckling load is :
- (A) 40 (B) 36
(C) 49 (D) 59
26. In virtual work principle, the work done by the frictional force acting on wheel when it rolls without slip is :
- (A) Zero (B) Positive
(C) Negative (D) None of these
27. A ball and socket joint forms :
- (A) Turning pair (B) Rolling pair
(C) Spherical pair (D) Sliding pair
28. A kinematic chain having N links will have :
- (A) $(N - 1)$ inversion
(B) N inversion
(C) $(N - 2)$ inversion
(D) $(N - 3)$ inversion

29. If the angle of repose is 30° , the maximum efficiency of inclined plane for motion up the plane is :
- (A) 50%
 - (B) 33.3%
 - (C) 75%
 - (D) Not possible to find
30. The angular velocities of two pulleys connected by crossed belt or open belt are :
- (A) directly proportional to their diameters
 - (B) inversely proportional to their diameters
 - (C) directly proportional to square of their diameters
 - (D) inversely proportional to square of their diameters
31. The crowning of the pulleys is done to :
- (A) prevent the belt running off the pulley
 - (B) improve the shape of pulley from safety considerations
 - (C) improve the strength of the pulley
 - (D) improve the torque transmitted by the pulley

32. The maximum fluctuation of energy of flywheel :
- (A) is directly proportional to coefficient of fluctuation of speed
 - (B) is directly proportional to square of angular velocity of flywheel
 - (C) is directly proportional to moment of inertia of flywheel
 - (D) all of the above
33. If the ball masses of a governor have same speed for all radii of rotation, it is said to be :
- (A) Stable
 - (B) Hunting
 - (C) Isochronous
 - (D) Sensitive
34. The product of circular pitch and the diametral pitch is equal to :
- (A) 2π
 - (B) π
 - (C) $\pi/2$
 - (D) 1
35. The path of the point of contact between the involute teeth profile gears is :
- (A) Circle
 - (B) Straight line
 - (C) Complex curve
 - (D) Parabola

36. The Burger's vector lies parallel to the dislocation line along the axis of a line of atoms in the same plane in :
- (A) Screw dislocation (B) Edge dislocation
- (C) Cracks (D) Vacancies
37. The locations of atoms and their particular arrangement in a given crystal are described by means of :
- (A) Potential energy (B) Space lattice
- (C) Intermolecular bond (D) Diffusion
38. The ability of a material to withstand bending without fracture is known as :
- (A) Mechanical strength (B) Stiffness
- (C) Toughness (D) Ductility
39. The process of growing large molecules from small molecules is known as :
- (A) Polymerization (B) Polymorphism
- (C) Hysteresis (D) Allotropy

40. A test used to determine the behaviour of materials when subjected to high rates of loading is known as :
- (A) Hardness test (B) Impact test
(C) Fatigue test (D) Torsion test
41. To increase the corrosion resistance of steel :
- (A) Vanadium is added as an alloying element
(B) Chromium is added as an alloying element
(C) Nickel is added as an alloying element
(D) Copper is added as an alloying element
42. The first product in the process of converting iron ore into useful metal from a blast furnace is known as :
- (A) Cast iron (B) Wrought iron
(C) Pig iron (D) Steel

43. When carbon in the cast iron is mostly in free state, the cast iron is known as :
- (A) Mottled cast iron (B) White cast iron
(C) Grey cast iron (D) Black cast iron
44. The process of introducing carbon and nitrogen into a solid ferrous alloy is known as :
- (A) Carbonitriding (B) Nitriding
(C) Carburizing (D) Cyaniding
45. In oblique cutting system, the chip flows over the tool face and the direction of the chip flow velocity is :
- (A) Normal to the cutting edge
(B) Parallel to the cutting edge
(C) Inclined with the normal to the cutting edge
(D) None of the above

46. The only angle on which the strength of the tool depends, is :
- (A) Clearance angle (B) Rake angle
(C) Cutting angle (D) Lip angle
47. The relationship between tool life (T) and cutting speed (V) is expressed as :
- (A) $V^n T = C$ (B) $\frac{V}{T} = C$
(C) $VT^n = C$ (D) $\frac{T}{V} = C$
48. A device which holds and locates a work piece during an inspection or for a manufacturing operation, is known as :
- (A) Fixture (B) Jig
(C) Lathe (D) Templates
49. In which milling operation, the cutting force tends to lift the work piece ?
- (A) Climb (B) Down
(C) Conventional (D) Face

50. Which of the following operation is required for making a chamfer on the edge of a hole ?
- (A) Spot facing (B) Countersinking
(C) Counterboring (D) Reaming
51. In electro-discharge machining process, in order to remove maximum metal and have minimum wear on the tool :
- (A) the tool is made cathode and work piece as anode
(B) the tool is made anode and the work piece as cathode
(C) the tool and work piece should be of different metals
(D) none of the above
52. Inadequate penetration in case of welding operation will lead to :
- (A) Crack formation (B) Corrosion
(C) Diffusion (D) Undercutting

53. The process of making hollow castings of desired thickness by permanent mould without the use of cores is known as :
- (A) die casting (B) slush casting
(C) pressed casting (D) centrifugal casting
54. The colour marked on the surface of a pattern to be machined is :
- (A) black (B) green
(C) red (D) blue
55. The most economic order quantity in terms of total item consumed per year (A), procurement cost (P) per order and the annual inventory carrying cost (C) per item is given by :
- (A) $\frac{AP}{2C}$ (B) $\frac{2AP}{C}$
(C) APC (D) $\sqrt{\frac{2AP}{C}}$
56. Critical path is obtained in PERT analysis by joining events having :
- (A) Maximum slack (B) Minimum slack
(C) Negative slack (D) Zero slack

57. The activities in a network diagram are represented by a :
- (A) Circle
 - (B) Square
 - (C) Rectangle
 - (D) Simple arrow drawn from left to right
58. Vernier caliper gauge improves the :
- (A) measuring sensitivity
 - (B) accuracy
 - (C) repeatability
 - (D) resolution
59. The ratchet mechanism in a micrometer screw gauge serves to :
- (A) Check wear out
 - (B) ensure a uniform measuring force
 - (C) eliminate play
 - (D) use it as a snap gauge

60. All the working surfaces and the cylindrical surfaces of the rollers of sine bar have a surface finish of the order of :
- (A) 0.2 micron (B) 0.5 micron
(C) 1 micron (D) 5 micron
61. The difference between the upper limit and lower limit of a dimension is known as :
- (A) Basic size (B) Nominal size
(C) Tolerance (D) Actual size
62. Which one of the following threads is having smallest included angle ?
- (A) Acme thread (B) BSW thread
(C) Buttress thread (D) Unified thread
63. When trying to turn a key into a lock, the following is applied :
- (A) Coplanar force (B) Lever
(C) Moment (D) Couple

64. Centre of gravity of a thin hollow cone lies on the axis at a height of :

- (A) one-fourth of the total height above base
- (B) one-third of the total height above base
- (C) one-half of the total height above base
- (D) three-eighth of the total height above the base

65. If a suspended body is struck at the centre of percussion, then the pressure on the axis passing through the point of suspension will be :

- (A) Maximum
- (B) Minimum
- (C) Zero
- (D) Infinity

66. If the velocity of projection is u m/sec and the angle of projection is α° , the maximum height of the projectile on a horizontal plane is :

- (A) $\frac{u^2 \cos^2 \alpha}{2g}$
- (B) $\frac{u^2 \sin^2 \alpha}{2g}$
- (C) $\frac{u^2 \tan^2 \alpha}{2g}$
- (D) $\frac{u^2 \sin^2 \alpha}{g}$

67. Which of the following feedback devices can sense both speed and position ?
- (A) Resolver (B) tachometer
- (C) Encoder (D) All of these
68. Which of the following non-contact inspection method uses a high frequency sound wave ?
- (A) Radiation (B) Reluctance
- (C) Ultrasonic (D) Capacitance
69. Gantt chart provides information about :
- (A) Inventory control (B) Production schedule
- (C) Material handling (D) Machine utilization

70. Which of the following drives is having the maximum power ?
- (A) DC motor (B) Stepper motor
(C) Hydraulic drive (D) Pneumatic drive
71. In a CNC machine tool, encoder is used to sense and control :
- (A) Spindle speed (B) Spindle position
(C) Table position (D) All of these
72. Weld spatter refers to :
- (A) Welding electrode (B) Flux
(C) Filler material (D) Welding defect
73. The welding of stainless steel is generally difficult because of the following reason :
- (A) Rust formation takes place
(B) High melting temperature of stainless steel
(C) Formation of oxide film
(D) Formation of chromium carbide

74. The following electrolyte is used in electro-chemical machining process :
- (A) Brine solution (B) Kerosene
(C) Transformer oil (D) Water
75. If the tearing efficiency of a riveted joint is 60%, then the ratio of pitch to diameter of rivet is :
- (A) 0.2 (B) 0.33
(C) 0.4 (D) 0.5
76. To accurately cut gears operating at velocities up to 20 m/s, the velocity factor is equal to :
- (A) $\frac{3}{3+v}$ (B) $\frac{6}{6+v}$
(C) $\frac{9}{9+v}$ (D) $\frac{0.75}{1+v} + 0.25$
77. The capillary rise at 20°C in a clean glass tube of 1 mm bore containing water is approximately :
- (A) 5 mm (B) 10 mm
(C) 20 mm (D) 30 mm

78. If D is the diameter of Pelton wheel and d is the diameter of the jet, then number of buckets on the periphery of a Pelton wheel is equal to :
- (A) $\frac{D}{2d}$ (B) $\frac{D}{2d} + 10$
 (C) $\frac{D}{2d} + 15$ (D) $\frac{D}{2d} + 20$
79. A plate of 600×900 mm is to be machined on a shaper. Cutting speed is 6 m/min., return time to cutting time ratio is 1 : 4 and the feed is 2 mm/stroke. Clearance at each end is 75 mm. The time required, in minutes on shaper to complete one cut would be :
- (A) 45 (B) 60
 (C) 80 (D) 90
80. A point moves with SHM whose period is 4 seconds, if it starts from rest at a distance 4 meters from the centre of its path, then the time it takes, before it has described 2 metres is :
- (A) $1/3$ second (B) $2/3$ second
 (C) $3/4$ second (D) $4/5$ second

81. There were two girls of Himachal Pradesh in the Indian Kabbaddi team that won gold medal at 2014 Asian Games ? Who were they ?

- (A) Puja Thakur and Savita Thakur
- (B) Savita Thakur and Kavita Thakur
- (C) Kavita Thakur and Namita Thakur
- (D) Puja Thakur and Kavita Thakur

82. Which sector of economy showed the highest increase in Domestic Product in Himachal Pradesh during 2012-13 ?

- (A) Primary Sector
- (B) Community and Personal Services
- (C) Transport and Trade
- (D) Finance and Real Estate

83. Persons of which age group are eligible for availing Skill Development Scholarship in Himachal Pradesh ?

- (A) 16-35 years
- (B) 18-35 years
- (C) 25-35 years
- (D) 20-30 years

84. At which place is Chandershekhar temple in Chamba District of Himachal Pradesh ?

- (A) Kilar
- (B) Tarela
- (C) Saho
- (D) Chawari

85. Which of the following is *not* a herbal/medicinal plant ?

- (A) Harar
- (B) Bahera
- (C) Amla
- (D) Sal

86. In which region of Himachal Pradesh is *Karthi Nati* popular ?
- (A) Una (B) Nalagarh
(C) Kullu (D) Sirmaur
87. When was Social Forestry Scheme launched in Himachal Pradesh ?
- (A) 1975-76 (B) 1980-81
(C) 1988-89 (D) 1996-97
88. Who is the author of Hindi story *Usne Kaha Tha* (उसने कहा था) ?
- (A) Lal Chand Prarthi
(B) Sardar Shobha Singh
(C) Piyush Guleri
(D) Chandradhar Sharma Guleri

89. To which district of Himachal Pradesh do freedom fighters Chaudhary Sher Jang, Sunehri Devi, Matha Ram and Deep Ram belong ?

(A) Una

(B) Kangra

(C) Sirmaur

(D) Chamba

90. What is the approximate breadth of Himachal Pradesh from South-West end of Kangra District to North-East end of Kinnaur District ?

(A) 125 kms

(B) 230 kms

(C) 270 kms

(D) 325 kms

91. Who won the 2014 Nobel Prize for literature ?

(A) Mario Vargas Llosa

(B) Patrick Modiana

(C) Herta Muller

(D) Doris Lessing

92. Who was the first chairman of the UGC ?

- (A) Dr. D.S. Kothari
- (B) Prof. Yash Pal
- (C) Prof. S.S. Bhatnagar
- (D) Prof. Ved Prakash

93. Where was Shakti Devi, who won the International Female Police Peace-keeper Award, posted for which she was given this award ?

- (A) East Timor
- (B) Iraq
- (C) Iran
- (D) Afghanistan

94. In the 2014-15 Union Budget which of the following has been promised an IIM ?

- (A) Jammu and Kashmir
- (B) Himachal Pradesh
- (C) Chhattisgarh
- (D) Goa

95. What is the formal name of Howrah bridge ?

(A) Rabindra Setu

(B) Hoogly Sutra

(C) Banga Setu

(D) Ganga Sutra

96. In which district of Maharashtra did B.R. Ambedkar start the *Mahar Satyagraha* ?

(A) Kolhapur

(B) Latur

(C) Ratnagiri

(D) Amaravati

97. Which country hosted the 2014 Asian Games ?

(A) South Korea

(B) North Korea

(C) Taipei

(D) China

98 Who is the President of Pakistan People's Party ?

- (A) Nawaz Sharif (B) Imran Khan
(C) Bilawal Bhutto (D) Asif Ali Zardari

99. What does the novel *The Narrow Road to the Deep Sea* which won the 2014 Booker prize centre around ?

- (A) Adventurous Journey of sailor during the Korean War
(B) Narrow navigation channel in the dead sea which often causes accidents
(C) Story of a survivor who escaped from the POW Camp in Vietnam
(D) Story of a surgeon in a Japanese POW Camp

100. To which country does Niels Bohr who invented the atomic structure belong ?

- (A) Belgium (B) Denmark
(C) Poland (D) Germany