BUS

PROVISIONAL ANSWER KEY

Name of the post	Assistant Professor, Production Engineering in Government Engineering College,GES,Class-2 (Special Recruitment-PwD-Second Attempt)
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THE LINK FOR ONLINE OBJECTION SYSTEM WILL START FROM 07-07-2026; 11:00 AM ONWARDS

Instructions / સૂચના

Candidate must ensure compliance to the instructions mentioned below, else objections shall not be considered: -

(1) Candidates have to pay fees of Rs.100/- for each objection. The fees can be paid from the link given herewith.

(2) The Candidate will be able to submit objection only after payment of the fees. The generation of the receipt will only be considered as final submission.

(3) The Candidate must retain the receipt of the payment of the fees. The fees, once paid, will not be refunded under any circumstances.

(4) All the objections should be submitted through **ONLINE OBJECTION SUBMISSION SYSTEM** only. Physical or submission through any other means will not be considered.

(5) All objections are to be submitted with reference to the Master Question Paper published with provisional answer key, published herewith on the website / online objection submission system. Objections should be sent referring to the Question No. & options of the Master Question Paper. Objections regarding question nos. and options other than provisional answer key (Master Question Paper) shall not be considered.

(6) Objections and answers suggested by the candidate should be in compliance with the responses given by him in his answer sheet. Objections shall not be considered, in case, if responses given in the answer sheet /response sheet and submitted objections are differed.

(7) Supportive document to the objection must be uploaded, without which objection will not be considered.

(8) Objections must be supported by authentic references or documentary evidence. Objections based solely on Al, GPT, or similar tools without supporting evidence shall not be considered. For calculation-based, mathematical, statistical, or reasoning questions, candidates shall provide the relevant calculation, methodology, or logical basis in support of the objection.

ઉમેદવારે નીચેની સૂચનાઓનું પાલન કરવાની તકેદારી રાખવી, અન્યથા વાંધા-સૂચન અંગે કરેલ રજૂઆતો ધ્યાને લેવાશે નહીં

(1) ઉમેદવારે દરેક વાંધા દીઠ રૂપિયા ૧૦૦/-ફી ભરવાની રહેશે. જે ફી આ સાથે આપેલ લીંક ઉપરથી ભરી શકાશે.

(2) ફી ભર્યા બાદ જ વાંધો સબમીટ થઈ શકશે. ફી ભર્યાની આખરી પહોંચ જ આખરી સબમીશન ગણાશે.

(3) ફી ભર્યાની પહોંચ ઉમેદવારે સાચવી રાખવાની રહેશે. એક વાર ભરેલ ફી કોઈ પણ પરિસ્થિતિમાં પરત આપવામાં આવશે નહિ.

(4) વાંધા ફક્ત **ઓનલાઈન ઓબ્જેકશન સબમીશન સીસ્ટમ** દ્વારા જ સબમીટ કરવાના રહેશે. રૂબરૂ, ટપાલ અથવા ઈ-મેઈલ કે અન્ય કોઈ રીતે આયોગને મોકલવામાં આવેલ વાંધા ધ્યાને લેવામાં આવશે નહીં, જેની ખાસ નોંધ લેવી.

(5) ઉમેદવારે પોતાને પરીક્ષામાં મળેલ પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્નક્રમાંક મુજબ વાંધા-સૂચનો રજૂ ન કરતાં, તમામ વાંધા-સૂચનો વેબસાઈટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કી(માસ્ટર પ્રશ્નપત્ર) ના પ્રશ્નક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા. માસ્ટર પ્રશ્નપત્રમાં નિર્દિષ્ટ પ્રશ્ન અને વિકલ્પ સિવાયના વાંધા ધ્યાને લેવામાં આવશે નહીં.

(6) ઉમેદવારે પ્રશ્નના વિકલ્પ પર વાંધો રજૂ કરેલ છે અને વિકલ્પ રૂપે જે જવાબ સૂચવેલ છે એ જવાબ ઉમેદવારે પોતાની ઉત્તરવહીમાં આપેલ હોવો જોઈએ. ઉમેદવારે સૂચવેલ જવાવ અને ઉત્તરવહીનો જવાબ ભિન્ન હશે તો ઉમેદવારે રજૂ કરેલ વાંધા ધ્યાને લેવાશે નહીં.

(7) વાંધા માટે સંદર્ભ જોડવો આવશ્યક છે, જેના વિના વાંધો ધ્યાને લેવામાં આવશે નહીં.

(8) વાંધો પ્રમાણભૂત અને અધિકૃત સંદર્ભો અથવા દસ્તાવેજી પુરાવાથી સમર્થિત હોવો આવશ્યક છે. માત્ર AI, GPT અથવા સમાન સાધનો દ્વારા જનરેટ કરાયેલ અને આધારભૂત પુરાવા વિનાના વાંધાઓની વિચારણા કરવામાં આવશે નહીં. ગણતરી આધારિત, ગાણિતિક, આંકડાશાસ્ત્રીય અથવા તાર્કિક પ્રશ્નોના કિસ્સામાં ઉમેદવારે સબંધિત ગણતરી, પદ્ધતિ અથવા તાર્કિક આધાર રજૂ કરવાનો રહેશે.

Website link for online objection submission system: https://www.formonline.co.in/GPSC_TRACK/SearchPage.aspx

1. For the matrix $\begin{pmatrix} 6 & 2 \\ 2 & 6 \end{pmatrix}$ the eigen values are
   A) 4 and 8
   B) 6 and 2
   C) -4 and 8
   D) 8 and 12

2. The trace of the matrix $\begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{pmatrix}^{15}$ is
   A) $1^{15} + 4^{15}$
   B) $2 \cdot 1^{15} + 4^{15}$
   C) $1^{15} + 2^{15} + 4^{15}$
   D) $3^{15} + 4^{15}$

3. The value of $\lim_{x\to 1}\left(\frac{x^7-2x^5+1}{x^3-3x^2+2}\right)$ is
   A) 0
   B) -1
   C) 1
   D) does not exist.

4. At the point x=0 , the function $f(x) = x^4$ has
   A) Local maximum
   B) Local minimum
   C) Both local maximum & local minimum
   D) Neither local maximum nor local minimum

5. $\lim_{x\to 0}\left(\frac{tanx-x}{x-sinx}\right)$ is

   A) 1
   B) 2
   C) 3
   D) Does not exist

6. Which of the following integral is unbounded?
   A) $\int_0^{\pi/4} \tan x \, dx$
   B) $\int_0^{\infty} \frac{1}{x^2+1} \, dx$
   C) $\int_0^{\infty} xe^{-x} dx$
   D) $\int_0^{1} \frac{1}{1-x} \, dx$

7. In the Taylor series expansion of $f(x) = e^{2x} + \sin(3x)$ about the point $x = \pi$, the coefficient of $(x-\pi)^3$ is

A) $\frac{4}{3}e^{2\pi} - \frac{9}{2}$

B) $\frac{4}{3}e^{2\pi} + \frac{9}{2}$

C) $4e^{2\pi} - \frac{9}{2}$

D) $\frac{8}{3}e^{2\pi} - \frac{9}{2}$

8. Green's theorem may be regarded as the two-dimensional analogue of
   A) Cauchy's theorem
   B) Divergence theorem
   C) Rolle's theorem
   D) Mean value theorem

9. Consider the following differential equation $\frac{dy}{dt} = -5y$; $initial\ condition\ y = 2\ at\ t = 0$
   The value of y at t=3 is
   A) $-5e^{-10}$
   B) $2e^{-10}$
   C) $2e^{-15}$
   D) $-15e^{2}$

10. The partial differential equation $\frac{\partial u}{\partial t} + u\frac{\partial u}{\partial x} = \nu\frac{\partial^2 u}{\partial x^2}$ is a
    Where ν is a constant. The equation is
    A) First-order and linear
    B) Second-order and quasi-linear
    C) Second-order and fully linear
    D) First-order and non-linear

11. What is the residue of the function $\frac{e^{3z}-1}{z^3}$ at z=0 ?
    A) 3/2
    B) 9/2
    C) 3/4
    D) 32

12. The argument of the complex number $\frac{1+i}{1-i}$, $where\ i = \sqrt{-1}$ is
    A) -π
    B) -π/2
    C) π/2
    D) π

13. Harmonic conjugate of $u = x^2 - y^2$ is
    A) $2xy$
    B) $-2xy$
    C) $x^2 + y^2$
    D) xy

14. A fair six-faced die is rolled 6 times. The probability (in decimal form) of obtaining exactly three SIXES is:
    A) 0.0268
    B) 0.0536
    C) 0.1072
    D) 0.2143

15. The chance of a student passing an exam is 20% . The chance of a student passing the exam and getting above 90% marks in it is 5% . Given that a student passes the examination, the probability that the student gets above 90% marks is
    A) 1/18
    B) 1/4
    C) 2/9
    D) 5/18

16. A manufacturing process produces 5% defective items. A random sample of 8 items is selected. The probability that exactly one item is defective is approximately:
    A) 0.279
    B) 0.336
    C) 0.663
    D) 0.057

17. Two fair six-sided dice are thrown simultaneously. What is the probability that exactly one of the two dice shows an even number?
    A) 1/4
    B) 1/2
    C) 3/4
    D) 1/3

18. Numerical integration using trapezoidal rule gives the best result for a single variable function , which is
    A) Linear
    B) Parabolic
    C) Logarithmic
    D) Hyperbolic

19. The integral $\int_1^3 \frac{1}{x} dx$, when evaluated by using Simpson's 1/3 rule on two equal sub-intervals each of length 1 , equals
    A) 1.000
    B) 1.11
    C) 1.098
    D) 1.120

20. For a simple root of the equation f(x)=0, the Newton–Raphson method exhibits which type of convergence?
    A) Linear convergence
    B) Quadratic convergence
    C) Cubic convergence
    D) Divergent convergence

21. The polynomial $p(x) = x^5 + x + 2$ has
    A) all real roots
    B) 3 real & 2 complex roots
    C) 1 real & 4 complex roots
    D) all complex roots

22. Given the Fourier series in $(-\pi,\ \pi)$ for f(x)= xcosx, the value of a_0 will be
    A) $\frac{-2}{3}\ \pi^2$
    B) 0
    C) 2
    D) $\frac{(-1)^n.2n}{n-1}$

23. Inverse Laplace transform of 1 is
    A) 1
    B) $\delta(t)$
    C) $\delta(t-1)$
    D) u(t)

24. Laplace transform of $(a+bt)^2$, where a & b are constants is given by
    A) $(a+bs)^2$
    B) $\frac{1}{(a+bs)^2}$
    C) $\frac{a^2}{s} + \frac{2ab}{s^2} + \frac{2b^2}{s^3}$
    D) $\frac{a^2}{s} + \frac{2ab}{s^2} + \frac{b^2}{s^3}$

25. Value of $L\,[e^{100t}\cos(200t)]$

A) $\frac{s-100}{(s-100)^2+40000}$

B) $\frac{s+100}{(s-100)^2-40000}$

C) $\frac{s-50}{(s-50)^2+1000}$

D) $\frac{s+50}{(s+50)^2-1000}$

26. Which of the following is an even function of t

A) t^2

B) t^2-4t

C) sin2t+3t

D) t^3+6

27. If $A=\begin{bmatrix} a & 1 \\ 1 & a \end{bmatrix}$ and $|A^2|=64$, then value of a equals

A) ± 3

B) ± 5

C) $\pm\sqrt{7}$

D) $\pm\sqrt{65}$

28. Consider the system of linear equations :

$x_1+2x_2-x_3=5$

$2x_1-x_2+3x_3=7$

$3x_1+x_2+2x_3=10$

The above system has

A) Infinitely many solutions

B) Exactly three solutions

C) A unique solution

D) No solution

29. In differential equation $x\frac{dy}{dx}+my=e^{-x}$, if the integrating factor is $\frac{1}{x^2}$ then value of m is

A) 2

B) -2

C) 1

D) -1

30. $\lim_{x\to 2}\ \frac{|x-2|}{x-2}$ is equal to :

A) 1

B) -1

C) 0

D) Does not exist

31. The value of $\left|e^{x+iy}\right|$ is

A) e^{x}

B) $e^{|x|}$

C) $e^{\sqrt{x^2+y^2}}$

D) $e^{|x|+|y|}$

32. If $(x+iy)^{1/3} = a+ib$, $then$ $\frac{x}{a}+\frac{y}{b}$ is equal to

A) $4(a^2+b^2)$

B) $4(a^2-b^2)$

C) $4(b^2-a^2)$

D) None of these

33. The vector field $\overrightarrow{F} = y\hat{\imath} + x\hat{\jmath}$ is

A) divergence free but not irrotational

B) Irrotational but not divergence free

C) divergence free and irrotational

D) neither divergence free nor irrotational

34. The value of the integral $\int_0^\infty \int_0^\infty e^{-x^2} e^{-y^2}\, dxdy$ is

A) $\sqrt{\frac{\pi}{2}}$

B) $\sqrt{\pi}$

C) π

D) $\frac{\pi}{4}$

35. The value of the integral $\int_{-\infty}^{\infty} \frac{dx}{x^2+4}$ is

A) $\frac{\pi}{2}$

B) $\frac{\pi}{4}$

C) π

D) 2π

36. The nature of singularity of function $f(z) = \frac{1}{sinz}$ at z=0 is

A) Removable singularity

B) Pole of order 2

C) Simple pole

D) Essential singularity

37. The order and degree of differential equation $\frac{d^3y}{dx^3} + 4\sqrt{(\frac{dy}{dx})^3 + y^2}$ =0 are respectively

A) 3 & 2
B) 2 & 3
C) 3 & 3
D) 3 & 1

38. If $u = \log\left(\frac{x^2+y^2}{x+y}\right)$ then what is value of $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$

A) 0
B) 1
C) u
D) eu

39. The solution of $\int_1^e \int_1^{e^2} \frac{1}{xy}\, dxdy$ is

A) 1
B) 2
C) e
D) 3

40. The value of expression $\lim_{x\to 0} \frac{\log(1+x) - x + \frac{x^2}{2}}{x^3}$ is

A) 1/2
B) -1/3
C) -1/2
D) 1/3

41. What does the principle of superposition state in statics?

A) Forces are always equal in magnitude.
B) Forces always act in opposite directions.
C) Forces cannot be resolved into components.
D) Forces can be added or subtracted algebraically.

42. Fatigue failure in materials occurs due to:

A) cyclic loading
B) low temperature
C) high temperature
D) constant stress

43. What percentage of chromium and nickel are usually present in stainless steel?

A) 15% Chromium, 5% Nickel
B) 16% Chromium, 6% Nickel
C) 17% Chromium, 7% Nickel
D) 18% Chromium, 8% Nickel

44. _____ has maximum malleability.
A) Aluminium
B) Copper
C) Lead
D) Wrought iron

45. The stress induced in a body, when suddenly loaded, is _____ the stress induced when the same load is applied gradually.
A) equal to
B) one-half
C) twice
D) four times

46. The maximum strain energy which can be stored by a body without undergoing permanent deformation is called as:
A) ultimate strain
B) proof resilence
C) linear strain
D) volumetric strain

47. What is the primary cause of distortion and cracking of the heat-treated steel part?
A) heating one section of the part more rapidly than other parts
B) increasing the soaking temperature too slowly
C) uneven expansion due to carbon deposits in the part
D) heating the part too slowly

48. _____ an be defined as time dependent increase in strain of a solid body under constant or controlled stress.
A) Shrinkage
B) Compaction
C) Creep
D) Elasticity

49. Steel containing less than 0.8% carbons are called _____ and those which contain more than 0.8% carbons are called _____.
A) hypoeutectoid, hypereutectoid
B) hypoeutectoid, austenite
C) hypereutectoid, hypoeutectoid
D) hypereutectoid, austenite

50. Which of the following options does NOT constitute a case-hardening technique?
    A) Tempering
    B) Carburizing
    C) Nitriding
    D) Cyaniding

51. The main purpose of spheroidising treatment is to improve
    A) Hardenability of low carbon steels
    B) Machinability of low carbon steels
    C) Hardenability of high carbon steels
    D) Machinability of high carbon steels

52. In tempering process the steel is heated to a temperature:
    A) Below the lower critical point
    B) Higher than the lower critical point
    C) In between the lower and upper critical point
    D) Higher than the upper critical point

53. 'Sorbite' is obtained when:
    A) Quenching steel during transformation
    B) Steel is annealed
    C) A fully hardened steel is finally 'drawn' at about 677°C
    D) None of these

54. How long should a steel component be heat treated before nitriding?
    A) 100-200 hours
    B) 300-500 hours
    C) 5-20 hours
    D) 21-100 hours

55. A body of weight 30 N rests on a horizontal floor. A gradually increasing horizontal force is applied to the body which just starts moving when the force is 9 N. The coefficient of friction between the body and the floor will be
    A) 10/3
    B) 3/10
    C) 1/3
    D) 1/9

56. A particle starts from rest and moves in a straight line whose equation of motion is given by $S = 2t^3 - t^2 - 1$ The acceleration of the particle after one second will be-

A) 8 m/s²
B) 6 m/s²
C) 4 m/s²
D) 10 m/s²

57. A ball is dropped vertically downwards, it hits the floor with a velocity of 9 m/s, and bounces to a distance of 1.2 m. The coefficient of restitution between the floor and the ball is
    A) 0.54
    B) 0
    C) 1
    D) 0.27

58. A rifle fires a light bullet, resulting in a large forward acceleration of the bullet and a minimal backward recoil acceleration of the rifle. If the forces are equal and opposite (Action/Reaction), why is the rifle's acceleration so much smaller than the bullet's?
    A) The reaction force of the bullet acts for a shorter duration than the action force.
    B) The acceleration is inversely proportional to the mass, and the rifle has a much greater mass than the bullet.
    C) The action force of the rifle on the bullet is greater than the reaction force of the bullet on the rifle.
    D) Action and reaction forces cancel out since they act instantaneously.

59. The angle turned by a wheel while it starts from rest and accelerates at a constant rate of 3 rad/s^2 for an interval of 20 sec is
    A) 900 rad
    B) 600 rad
    C) 1200 rad
    D) 300 rad

60. For the frame to be deficient, the relation between joints and members will be:
    A) $m < 2j - 3$
    B) $2j = m + 3$
    C) $m > 2j - 3$
    D) $2j = m - 3$

61. An annular disc has a mass m, inner radius R and outer radius 2R. The disc rolls on a flat surface without slipping. If the velocity of the centre of mass is v, the kinetic energy of the disc is
    A) $\frac{9}{16}mv^2$
    B) $\frac{11}{16}mv^2$
    C) $\frac{13}{16}mv^2$
    D) $\frac{15}{16}mv^2$

62. A thin cylinder of 100 mm internal diameter and 5 mm thickness is subjected to an internal pressure of 10 MPa and a torque of 2000 Nm. Calculate the magnitudes of the principal stresses.
A) 1098, 45.2
B) 1098, 40.2
C) 1098, 31
D) 1098, 50

63. According to Euler's theory, if the effective length of a long column is increased by 100% while all other parameters remain unchanged, the buckling load of the column will become:
A) Doubled
B) Halved
C) Reduced to one-fourth
D) Reduced to one-eighth

64. The piston rod of diameter 20 mm and length 700 mm in a hydraulic cylinder is subjected to a compressive force of 10 kN due to the internal pressure. The end conditions for the rod may be assumed as guided at the piston end and hinged at the other end. The Young's modulus is 200 GPa.
The factor of safety for the piston rod is
A) 0.68
B) 2.75
C) 6.32
D) 11.0

65. _____ is defined as the localisation of high stresses due to the irregularities present in the component and abrupt changes of the cross-section
A) Strain concentration
B) Stress concentration
C) Strain behaviour
D) Stress behaviour

66. The S-N curve for steel becomes asymptotic nearly at
A) 10^3 cycles
B) 10^4 cycles
C) 10^6 cycles
D) 10^9 cycles

67. In a band brake the ratio of tight side band tension to the tension on the slack side is 3. If the angle of overlap of band on the drum is 180° the coefficient of friction required between drum and the band is

A) 0.20
B) 0.25
C) 0.30
D) 0.35

68. According to maximum shear stress theory, with comparison to yield strength in tension, the yield strength in shear is
A) half the yield strength in tension
B) same as that of yield strength in tension
C) double the yield strength in tension
D) 1.33 times that of the yield strength in tension.

69. According to Tresca theory, yield locus is a/an
A) rectangle
B) circle
C) hexagon
D) ellipse

70. Which of the following statements is true regarding a fixed beam?
A) The deflection and slope at the fixed end are zero.
B) A fixed beam is always supported on more than two supports.
C) A fixed beam does not experience end moments
D) The deflection at the fixed ends is zero, but the slope is not zero.

71. A free end of a cantilever beam rotates by 0.001 radians under a point load 10 kN. Then deflection at the free end due to a moment of 100 KN - m is:
A) 10 mm
B) 20 mm
C) 25 mm
D) 40 mm

72. Two identical simply supported beams in which beam 'A' carries a central load of W and beam 'B' carries a uniformly distributed load such that wl = W, where w = uniformly distributed load and I = span of the identical beams, then the ratio of maximum deflection between B and A
A) 5/8
B) 8/5
C) 5/4
D) 4/5

73. For a solid circular beam subjected to a transverse shear force, which of the following statements about the shear stress distribution diagram (SSD) is correct?
    A) Shear stress is constant across the cross-section.
    B) Shear stress is maximum at the outer surface and zero at the centre.
    C) Shear stress varies parabolically and is maximum at the neutral axis.
    D) Shear stress varies linearly from centre to surface.

74. A cantilever beam of T cross-section carries uniformly distributed load. Where does the maximum magnitude of bending stress occur?
    A) At the top of cross-section
    B) At the junction of flange and web
    C) At the mid-depth point
    D) At the bottom of the section

75. A rectangular beam of uniform strength and subjected to a bending moment 'M' has a constant width. The variation in depth will be proportional to
    A) 1/M
    B) M
    C) √M
    D) M2

76. In a simply supported beam, maximum shear stress in a triangular cross-section (altitude h) occurs at a distance:
    A) h/3 from bottom of beam
    B) h/3 from top of the beam
    C) h/6 from neutral axis
    D) h/5 from top the beam

77. Calculate the torsional moment of a solid shaft which transmits a power of 330 kW at 300 r.p.m.
    A) 550 N-m
    B) 15900 N-m
    C) 10510 N-m
    D) 2810 N-m

78. Consider the Grubler's equation for the planar mechanism given below, $f = 3(n - 1) - 2j$. What does the variable 'n' represent in the above equation?
    A) number of links
    B) number of lower pairs
    C) number of mobile links
    D) length of the longest links

79. The lengths of the links of a 4 bar linkage with revolute pairs only are p, q, r and s units. Given that $p < q < r < s$. Which one of these links should be fixed, for obtaining a double crank mechanism ?

A) Link of length 'p'
B) Link of length 'q'
C) Link of length 'r'
D) Link of length 's'

80. In a cam follower motion, the follower has constant acceleration when it moves with
A) polynomial motion
B) parabolic motion
C) simple harmonic motion
D) cycloidal motion

81. A cam rotates at 1200 rpm. If the follower rises in 90° of cam rotation, how much time is required for the rise?
A) 0.035 seconds
B) 0.025 seconds
C) 0.0125 seconds
D) 0.0425 seconds

82. Which of the following component in machines controls the speed variations caused by the fluctuation of the engine turning moment during each cycle of operation?
A) Flywheel
B) Gyroscope
C) Pantograph
D) Crankshaft

83. The flywheel of a steam engine has a radius of gyration of 1 m and mass of 2500 kg. the starting torque of the engine is 2500 N-m. The kinetic energy of such a flywheel after 10 sec from rest position will be
A) 120 kN-m
B) 135 kN-m
C) 130 kN-m
D) 125 kN-m

84. While designing a typical bolt having uniform strength, the stress concentration in the thread of a bolted joint in simple loading is:
A) High
B) Low
C) Medium
D) Zero

85. In mechanical engineering, bolts are generally designed based on which type of stress?
    A) Impact stress
    B) Fatigue stress
    C) Direct tensile stress
    D) Shear stress

86. Which of the following is an advantage of using the Hole Basis System in manufacturing?
    A) Eliminates the need for tolerances
    B) Easier machining of holes with standard tools
    C) Requires less precision in manufacturing
    D) Makes it difficult to achieve interchangeability

87. A clearance fit is obtained from -
    A) H7/n6
    B) H7/g6
    C) H7/m6
    D) None of the above

88. What is the primary function of a lubricant?
    A) To minimize the friction between two moving surfaces
    B) To increase friction between moving surfaces.
    C) To absorb heat from the engine.
    D) To increase wear and tear of components.

89. Which of the following is NOT listed as a type of lubricating system used in engines?
    A) Water lubrication
    B) Splash lubrication
    C) Dry sump lubrication
    D) Petrol-oil lubrication

90. What is the primary safety advantage of the protected type flange coupling?
    A) It protects the workman from injuries due to protruding bolts and nuts.
    B) It enhances the torsional rigidity of the system.
    C) It provides automatic lubrication to the shaft.
    D) It minimises friction between the shaft and the coupling.

91. A solid shaft is replaced by a hollow shaft of the same material and weight. To achieve the same strength in torsion, the outer diameter of the hollow shaft should be:
    A) less than the diameter of the solid shaft
    B) independent of the diameter of the solid shaft
    C) greater than the diameter of the solid shaft
    D) equal to the diameter of the solid shaft

92. Key way on a shaft is made with a _____ chisel
    A) cross cut
    B) round nose
    C) flat
    D) side cut
93. In a cycloidal gear tooth profile, the flanks and faces of the teeth are generated by:
    A) A point on a circle rolling inside and outside a base circle.
    B) An involute curve only.
    C) A circular arc centered on the gear axis.
    D) A parabolic curve.

94. The tooth thickness of the 4 mm module gear measured at the pitch circle line is
    A) 4 mm
    B) 5 mm
    C) 6 mm
    D) 6.3 mm

95. A gear having a diameter of 40 cm transmits 10 kW at 250 r.p.m. If the pressure angle is 20°, the force on the tooth of the gear is:
    A) 2075 N
    B) 2100 N
    C) 1935 N
    D) 2032 N

96. Lewis's equation in spur gears are used to find the
    A) Tooth axial stress
    B) Shear stress
    C) Bending stress
    D) Fatigue stress

97. Slip and creep are related to the operation of:
    A) gear drive systems
    B) all types of belt drive systems
    C) V-belt drive systems only
    D) flat belt drive systems only

98. In a belt drive system, when the speed of the belt increases
    A) Co-efficient of friction between the belt and pulley increases
    B) Co-efficient of friction between the belt and pulley decreases
    C) Power transmitted will decrease
    D) Power transmitted will increase

99. A self-energising brake is one in which ____.
A) the brake operates without friction
B) no external force is needed
C) an external force is required to apply the brake
D) the friction force helps in applying the braking force

100. For disk and pad arrangement, increase of braking torque is not dependent on:
A) Number of pads
B) Increase the pad contact area
C) Number of disk
D) Radius of center of pad contact from axis of disk rotation

101. Why does a multi-plate clutch transmit more torque than a single-plate clutch?
A) It has a larger diameter
B) It has less contact area.
C) It has a stronger pressure plate.
D) It has more friction surfaces.

102. A single-plate clutch is transmitting 20 kW of power at 3,000 r.p.m. Assuming the coefficient of friction is 0. 35 and the mean radius is 0. 15 m, calculate the required axial force.
A) 150 N
B) 303 N
C) 403 N
D) 1212. 4 N

103. The stress in a thin spherical shell under internal pressure is _____.
A) Equal to the longitudinal stress
B) Independent of the longitudinal stress
C) Half the longitudinal stress
D) Twice the longitudinal stress

104. Water is flowing in a pipe of 200 cm diameter under a pressure head of 10000 cm. The thickness of the pipe wall is 0.75 cm. The tensile stress in the pipe wall in MPa is:
A) 13.0
B) 100
C) 130.5
D) 1305

105. The true statement about unit of kinematic viscosity is:
A) 1 stoke = 1 cm^2/s
B) 10 stoke = 1 cm^2/s
C) 1 stoke = 10 cm^2/s
D) 1 stoke = 100 cm^2/s

106. A tank 1.5 m high stands on a trolly and is full of water. It has an orifice of diameter 0.1 m at 0.3 m from the bottom of the tank. Coefficient of discharge of the orifice is 0.60. Discharge from the orifice is:
A) 0.013 m^3/s
B) 0.023 m^3/s
C) 0.033 m^3/s
D) 0.13 m^3/s

107. Hagen-Poiseuille equation is often employed for experimental determination of …….of the fluid:
A) Viscosity
B) Density
C) Vorticity
D) Intensity

108. In Bernoulli's equation $\frac{p}{\rho g} + \frac{v^2}{2g} + z$ = constant, $\frac{v^2}{2g}$ represent _____.
A) pressure head
B) potential head
C) datum head
D) kinetic head

109. Bernoulli's equation is applied to
A) Venturimeter
B) Orifice meter
C) Pitot tube meter
D) All of the above

110. Water flows into a pipe of diameter 7 cm at 20 km/hr and exits through 'n' number of holes each of diameter 1 cm from the other end at 70 km/hr. Find 'n'.
A) 14
B) 7
C) 21
D) 28

111. For laminar flow through a long pipe, the pressure drop per unit length increases
A) in linear proportion to the cross-sectional area
B) in proportion to the diameter of the pipe
C) in inverse proportion to the cross-sectional area
D) in inverse proportion to the square of crosssectional area

112. In a fluid flow, if the inertia forces are very large as compared to the viscous force, then the type of flow of fluid is called _____.

A) laminar flow
B) turbulent flow
C) transition flow
D) either laminar flow or turbulent flow

113. Water is flowing in a rectangular channel with a width of 8 m and depth 2 m is having a bed slope of 1 in 3200. What would be the maximum discharge (m^3/s) in the channel if the Chezy's constant is 50?

A) 10
B) 5
C) 6
D) 7

114. The velocity distribution in laminar flow in a pipe is:

A) Uniform
B) Parabolic
C) Linear
D) Turbulent

115. In a turbulent flow in a pipe, the shear stress is

A) maximum at the center and decreases linearly towards the wall
B) maximum at the center and decreases logarithmically towards the wall
C) maximum midway between the center line and the wall
D) maximum at the wall and decreases linearly to zero value at the center

116. Which of the following is the primary cause of water hammer?

A) High fluid viscosity
B) Increase in pipe diameter
C) Sudden changes in flow velocity
D) Low water temperature

117. Which of the following statements about manometric head is correct?

A) It is the effective head that accounts for losses.
B) It represents only the suction head of a pump.
C) It does not include friction losses.
D) It is a constant value for all pumps.

118. A tank carries an ideal gas at an absolute pressure of 4 bar at 27°C. If the temperature is increased to 60°C, the pressure inside the tank is

A) 4.44 bar
B) 2.22 bar
C) 8.88 bar
D) 5.55 bar

119. In the relation $\alpha = \beta t + \lambda$, α and λ is measured in meter (m) and t is measured in second (s). The SI unit of β must be

A) m
B) m s
C) s
D) ms^{-1}

120. If momentum P, acceleration A and volume V are the fundamental units, then the dimensional formula for the kinetic energy will be:

A) $[P^1 A^{1/2} V^{1/6}]$
B) $[P^2 A^{1/2} V^{1/6}]$
C) $[P^1 A^1 V^{1/6}]$
D) $[P^1 A^{1/2} V^1]$

121. Among the polytropic processes, which is the correct one for n = 1 ?

A) Adiabatic process
B) Reversible process
C) Isothermal process
D) Irreversible process

122. For an irreversible engine, the following holds correct:

A) $\oint \frac{\delta Q}{T} < 0$
B) $\oint \frac{\delta Q}{T} > 0$
C) $\oint \frac{\delta Q}{T} = 0$
D) $\oint \frac{\delta Q}{T} > 1$

123. A Carnot engine working between 650 K and 310 K produces 150 kJ of work. Find the heat supplied during this process.

A) 286.75 kJ
B) 150 kJ
C) 323.87 kJ
D) 213.82 kJ

124. 110 joule of heat is added to a gaseous system, whose internal energy is 40 J. Then the amount of external work done is

A) 150 J
B) 70 J
C) 110 J
D) 40 J

125. It is impossible to construct a device which, operating in a cycle, will produce no effect other than transfer of heat from a cooler to a hotter body. This is:
A) Kelvin statement
B) Clausius statement
C) Planck statement
D) Conservation of energy

126. A cycle consisting of two constant pressure and two isentropic processes is known as
A) Carnot cycle
B) Stirling cycle
C) Otto cycle
D) Brayton cycle

127. Thermal conductivity of solid metals with rise in temperature normally
A) Increases
B) Decreases
C) Remains constant
D) Unpredictable

128. The rate of energy emission from unit surface area through unit solid angle, along a normal to surface is known as
A) Emissivity
B) Transmissivity
C) Reflectivity
D) Intensity of radiation

129. Fourier's law of heat conduction is valid for
A) One dimensional cases only
B) Two dimensional cases only
C) Three dimensional cases only
D) Irregular surfaces

130. In a shaper machine, the cutting action occurs during:
A) Only the forward stroke
B) Only the return stroke
C) Both forward and return strokes
D) Only at the start of the stroke

131. Crater wear always starts at some distance from the tool tip because at that point
A) cutting fluid does not penetrate
B) chip tool interface temp is maximum
C) normal stress on rake face is maximum
D) tool strength is minimum

132. For cutting double start screw threads of pitch 1.0 mm on a lathe, the thread cutting tool should have a feed rate of
A) 0.5 mm/rev
B) 1.0 mm/rev
C) 2.0 mm/rev
D) 4.0 mm/rev

133. Quick return mechanism is incorporated in a
A) Lathe machine
B) Milling machine
C) Drilling machine
D) Shaping machine

134. The main alloying elements in high speed steel in order of increasing proportion are
A) Vanadium, chromium, tungsten
B) Tungsten, titanium, vanadium
C) Chromium, titanium, vanadium
D) Tungsten, chromium, titanium

135. Which of following gear manufacturing processes is based on generation principle.
A) Gear hobbing
B) Gear shaping
C) Gear milling
D) Gear shaving

136. The main purpose of boring operation, as compared to drilling is to:
A) Drill a hole
B) Finish the drilled hole
C) Correct the hole
D) Enlarge the existing hole

137. What is the axis of rotation of a horizontal milling cutter relative to the surface of the worktable?
A) Vertical
B) Inclined
C) Horizontal
D) Curved

138. A straight teeth slab milling cutter of 100 mm diameter and 10 teeth rotating at 150 r.p.m. is used to remove a layer of 3 mm thickness from a steel bar. If the table feed is 400 mm/minute, the feed per tooth in this operation will be:
A) 0.26 mm
B) 0.4 mm
C) 0.5 mm
D) 0.6 mm

139. Dressing a grinding wheel restores cutting efficiency by:
A) Reducing abrasive grain size
B) Exposing new abrasive grains
C) Filling pores with bond
D) Hardening wheel material

140. Which is the most widely used bond that has high porosity and strength?
A) Silicate bond
B) Resinoid bond
C) Vitrified bond
D) Shellac bond

141. In the broaching operation :
A) Production capacity is high because cutting speed is high
B) Production capacity is low because cutting speed is low
C) Production capacity is high though cutting speed is low
D) None of the above

142. Tapping is the operation of _____.
A) cutting internal threads in a hole
B) sizing and improving the geometry and finish of a previously drilled hole
C) machining flat surfaces on work pieces
D) providing tapered entrance to the hole

143. Which of the following screw thread is adopted for power transmission in either direction?
A) Acme threads
B) Square threads
C) Buttress threads
D) Multiple threads

144. Which of the following is NOT a type of common threaded fastener?
A) Nail
B) Bolt
C) Screw
D) Nut

145. In galvanic corrosion, the corrosion rate is increased when:
A) The metals are electrically isolated
B) The two metals are connected and exposed to an electrolyte
C) The electrolyte is removed from the system
D) The two metals have similar electrochemical potentials

146. In blue matching, the colouring material generally used is:
A) White zinc paste
B) Blue Graphite
C) Blue lead
D) Prussian blue

147. Blow molding process to produce object such as bottles & floatable objects can be applied to only
A) Thermo setting plastics
B) Thermo plastics
C) Lamented plastics
D) Reinforced plastics

148. How is the material removal rate (MRR) primarily controlled in ECM?
A) By increasing the mechanical pressure of the tool
B) By altering the dielectric fluid's viscosity
C) By adjusting the spark frequency and energy
D) By varying the current density and electrolyte flow rate

149. The servo control system in EDM is used to:
A) Regulate tool wear
B) Control the dielectric temperature
C) Adjust voltage between pulses
D) Maintain constant spark gap between electrode and workpiece

150. In an ultrasonic machining (USM) process, the material removal rate (MRR) is plotted as a function of the feed force of the USM tool. With increasing feed force, the MRR exhibit the following behaviour:
A) increases linearly
B) decreases linearly
C) does not change
D) first increases and then decreases

151. The type of energy used in electrical discharge wire cutting is:
A) Thermal Energy
B) Mechanical Energy
C) Chemical Energy
D) Electrical Energy

152. The process type of plant layout is suitable in
A) Batch and Mass production
B) Job shop and Mass production
C) Job shop and Batch production
D) None of the above

153. Which of the following plant layout is most suitable for automobile manufacturing units?
A) Product layout
B) Process layout
C) Fixed position layout
D) Group layout

154. In a single server infinite population queuing model. Arrivals follow a Poisson distribution with mean A = 4 per hour. The service times are exponential with mean service time equal to 12 minutes. The expected length of the queue will be
A) 4
B) 3.2
C) 1.25
D) 24.3

155. SIMO charts are used in
A) Method study
B) Micromotion study
C) Process analysis
D) Layout

156. Gannt chart gives the information about
A) Breakeven point analysis
B) Material handling layout
C) Production schedule
D) Determining selling price

157. While scheduling decisions, the most influencing parameter is:
A) market research
B) sales forecasting
C) competitor pricing
D) availability of skilled personnel

158. The primary purpose of job rating or evaluation is to:
A) provide benefits like leave and housing
B) assess an employee's performance
C) motivate employees for higher production
D) determine the relative worth of different jobs

159. In job shop scheduling, which sequence of operations typically results in optimal resource utilization and minimization of job waiting times?
A) First In, First Out (FIFO)
B) Shortest Processing Time (SPT) first
C) Earliest Due Date (EDD)
D) Longest Processing Time (LPT) first

160. Which of the following is NOT a characteristic of a formal organization structure?
A) Defined roles and responsibilities
B) Informal communication
C) Hierarchy of authority
D) Systematic procedures

161. The purpose of scheduling in Production Planning and Control is to:
A) design new product layouts
B) determine the cost of materials
C) hire new personnel
D) ensure products are completed on time

162. Which legislation primarily governs industrial relations in India?
A) The Industrial Disputes Act, 1947
B) The Consumer Protection Act, 2019
C) The Companies Act, 2013
D) The Income Tax Act, 1961

163. The Factories Act, of 1948 provides that creches be established and maintained for the use of children under the age of six years in factories employing
A) More than thirty women workers
B) More than twenty-five women workers
C) More than twenty women workers
D) More than fifty women workers

164. Drone entrepreneurs are those who live on the
A) Innovation and new ideas of the Government
B) Labour of others.
C) Victory of others
D) Environmental factors

165. ABC-analysis is based on -
A) Parkinson principle
B) Porter's principle
C) Pareto principle
D) Philip Kotler's principle

166. The process of converting wet waste to manure is called:
A) Incineration
B) Composting
C) Conservation
D) Metabolism

167. Quality in a product or service is not what the supplier puts in. It is what the customer gets out and willing to pay for" said by _____.
A) Philip Crosby
B) Joseph M. Juran
C) Peter Drucker
D) Michael Maccoby

168. 'Fishbone diagram' is also known as
A) Cause and effect diagram
B) Data model diagram
C) Eye diagram
D) Radial diagram

169. A group of institutions had invested Rs 200 Cr in the year 2010 to improve the Learning Outcomes of their students. In order to know whether the investment has yielded the desired results, the group should perform:
A) Cost benefit Analysis
B) Tangible benefit Analysis
C) Intangible benefit Analysis
D) Cost effectiveness Analysis

170. Quality Assurance is:
A) Process oriented
B) Product oriented and identifying the quality issues in product
C) Process oriented and preventing quality issues
D) Need oriented

171. In total quality management approach, _____ based decision-making is included as a principle.
A) Customer
B) Employee
C) Fact
D) Service

172. Choose the correct set of options in defining the process of 'Six Sigma' in strategic implementation.

P. Define
Q. Measure
R. Establish
S. Improve
T. Analyze

Choose the correct answer from the options given below:

A) R → S → Q → T → P
B) S → Q → P → T → R
C) T → S → Q → P → R
D) P → Q → T → S → R

173. Compute the total annual charge on installation costing of ₹2,00,000/- to buy and install if the estimated life is 20 years with no scrap value. The interest rate is 5% compounded annually.

A) ₹10000
B) ₹5760
C) ₹12250
D) ₹15760

174. The goods that do not vanish after a single act of consumption is

A) Non-durable consumer goods
B) Single use consumer goods
C) Perishable consumer goods
D) Fast moving consumer goods

175. Consider the following statement about 'Bathtub' curve

1. Wear out phase has constant level of failure
2. Useful life phase has constant level of failure
3. Run-in phase has high level of failure.

Which of the above statement is/are true?

A) 1 and 2 only
B) 1, 2 and 3
C) 3 only
D) 2 and 3 only

176. What specific action is mandated as a border measure under the TRIPS agreement to enforce Intellectual Property Rights?

A) Implementation of civil remedies such as injunctions and damages
B) Mandatory public disclosure of technical details of intercepted goods

C) Seizure of infringing goods at customs
D) Imposition of criminal sanctions and imprisonment for domestic manufacturers

177. Intellectual Property Rights (IPRs) protect the use of information and ideas that are of
A) Social value
B) Moral value
C) Commercial value
D) Ethical value

178. A key advantage of qualitative forecasting methods is that they:
A) are based on solid statistical data
B) are useful when accurate historical data is unavailable
C) focus solely on past demand trends
D) require minimal input from experts

179. A successful vendor development programme leads to:
A) higher costs and lower quality
B) limited supplier options
C) improved supplier performance and stronger partnerships
D) increased operational inefficiencies

180. Which of the following is a technique commonly used to smooth out demand fluctuations?
A) Build-up inventory
B) Discounting prices
C) Demand shifting
D) Offering promotional sales

181. The demand rate for a particular item is 12000 units/year. The ordering cost is Rs.100 per order and the holding cost is Rs.0.80 per item per month. If no shortages are allowed and the replacement is instantaneous, then the economic order quantity is
A) 1500 units
B) 2000 units
C) 500 units
D) 1000 units

182. Which one of the following is not a casual forecasting method?
A) Trend adjusted exponential smoothing
B) Econometric models
C) Linear regression
D) Multiple regression

183. The break-even point on a chart represents which of the following?
A) The point where total revenue equals total variable costs
B) The level of sales where total revenue equals total costs
C) The point where total cost equals total fixed costs
D) The level of sales where total revenue equals total fixed costs

184. At break-even point, profit is -
A) Maximum
B) Zero
C) Minimum
D) Negative

185. A toy manufacturing factory has annual capacity of toys. If the fixed are rupees 1 lakh/year, variable cost rupees 20 per unit and the selling price rupees 40 per unit, the quantity to break-even is units.
A) 5000
B) 2500
C) 3000
D) 4000

186. The main objective of aggregate planning is to:
A) minimise labour cost only
B) maximise machine utilisation only
C) minimise raw material cost
D) minimise total production cost over planning period

187. Which of the following statements is NOT correct for 'Product Layout'?
A) More process inventory
B) Less space requirement for same volume of production
C) Smooth and continuous workflow
D) Better co-ordination and simple production planning and control

188. Which of the following strategies in Aggregate Production Planning maintains a constant workforce while managing demand fluctuations through inventory and backorders?
A) Chase Strategy
B) Demand Management Strategy
C) Level Strategy
D) Hybrid Strategy

189. Which is not a part of the PDCA cycle (Deming wheel)?

A) Do
B) Plan
C) Check
D) Approve

190. Which characteristic of Mixed Model Line Balancing allows flexibility in adjusting the output of different products?

A) The production line must be stopped and reconfigured every time the product demand changes.
B) Only identical products can be produced on the same assembly line.
C) Products must have similar tasks and processing requirements to ensure smooth workflow
D) Each product should have entirely different operations to maximise variety.

191. What is the full form of COMSOAL?

A) Computerised Simulation and Optimisation of Assembly Line
B) Computer Method for Sequencing Operations for Assembly Lines
C) Computerised Solution of Assembly Line Balancing
D) Computerised Simulation of Assembly Line

192. Observed time for a worker is 0.7 minutes and his performance rating is 80%. Calculate the normal time taken by the worker.

A) 0.7 minutes
B) 0.56 minutes
C) 0.875 minutes
D) 0.95 minutes

193. Work study is mainly aimed at

A) Determining the most efficient method of performing a job
B) Establishing the minimum time of completion of job
C) Developing the standard method and standard time of a job
D) Economizing the motions involved on the part of the worker while performing a job.

194. The abbreviation EOQ stands for

A) Economic Order Quantity
B) Environmentally Operational Quality
C) Efficient Operational Qualifier
D) Ergonomic Office Quality

195. Which technology is primarily responsible for the rapid development of customized smart components in modern manufacturing?
A) Sand Casting
B) Additive Manufacturing
C) Forging
D) Extrusion

196. Self-healing polymers belong to the category of:
A) Thermoplastics
B) Conventional Polymers
C) Smart Materials
D) Refractory Materials

197. Digital Twin technology in fluid systems is mainly used for:
A) Material recycling
B) Real-time monitoring and simulation
C) Heat treatment
D) Surface coating

198. Industry 4.0 is primarily characterized by the integration of:
A) Manual production systems
B) Steam-powered machines
C) IoT, AI, and Cyber-Physical Systems
D) Conventional assembly lines

199. Which advanced material is widely used in aerospace applications due to its high strength-to-weight ratio?
A) Grey Cast Iron
B) Mild Steel
C) Carbon Fiber Reinforced Polymer
D) Brass

200. In smart manufacturing, automated inspection systems that use cameras and artificial intelligence to identify product defects are primarily based on:

A) Powder Metallurgy
B) Computer Vision
C) Resistance Welding
D) Hot Rolling