

## BEH-2

### PROVISIONAL ANSWER KEY

Name of The Post

Deputy Executive Engineer (Mechanical), Class-2 (GWSSB)

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### Instructions / સૂચના (Physical Submission)

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

- (1) All the suggestion should be submitted in prescribed format of suggestion sheet **PHYSICALLY.**
- (2) Question wise suggestion to be submitted in the prescribed format (Suggestion Sheet) published on the website.
- (3) All suggestions are to be submitted with reference to the Master Question Paper with provisional answer key (Master Question Paper), published herewith on the website. Objections should be sent referring to the Question, Question No. & options of the Master Question Paper.
- (4) Suggestions regarding question nos. and options other than provisional answer key (Master Question Paper) shall not be considered.
- (5) 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 suggestions are differed.
- (6) Objection for each question shall be made on separate sheet. Objection for more than one question in single sheet shall not be considered & treated as Cancelled.
- (7) Candidate who is present in the exam entitled to submit the objection/(s).
- (8) Candidate should attach copy of his/her OMR (Answer sheet) with objection/(s).

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

- (1) ઉમેદવારે વાંધા-સૂચનો નિયત કરવામાં આવેલ વાંધા-સૂચન પત્રકથી રજૂ કરવાના રહેશે.
- (2) ઉમેદવારે પ્રશ્નપ્રમાણે વાંધા-સૂચનો રજૂ કરવા વેબસાઈટ પર પ્રસિધ્ધ થયેલ નિયત વાંધા-સૂચન પત્રકના નમૂનાનો જ ઉપયોગ કરવો.
- (3) ઉમેદવારે પોતાને પરીક્ષામાં મળેલ પ્રશ્નપુસ્તિકામાં છપાયેલ પ્રશ્નક્રમાંક મુજબ વાંધા-સૂચનો રજૂ ન કરતા તમામ વાંધા-સૂચનો વેબસાઈટ પર પ્રસિધ્ધ થયેલ પ્રોવિઝનલ આન્સર કી (માસ્ટર પ્રશ્નપત્ર)ના પ્રશ્ન ક્રમાંક મુજબ અને તે સંદર્ભમાં રજૂ કરવા.
- (4) માસ્ટર પ્રશ્નપત્ર માં નિર્દિષ્ટ પ્રશ્ન અને વિકલ્પ સિવાયના વાંધા-સૂચન ધ્યાને લેવામાં આવશે નહીં.
- (5) ઉમેદવારે જે પ્રશ્નના વિકલ્પ પર વાંધો રજૂ કરેલ છે અને વિકલ્પ રૂપે જે જવાબ સૂચવેલ છે એ જવાબ ઉમેદવારે પોતાની ઉત્તરવહીમાં આપેલ હોવો જોઈએ. ઉમેદવારે સૂચવેલ જવાબ અને ઉત્તરવહીનો જવાબ ભિન્ન હશે તો ઉમેદવારે રજૂ કરેલ વાંધા-સૂચન ધ્યાનમાં લેવાશે નહીં.
- (6) એક પ્રશ્ન માટે એક જ વાંધા-સૂચન પત્રક વાપરવું. એક જ વાંધા-સૂચન પત્રકમાં એકથી વધારે પ્રશ્નોની રજૂઆત કરેલ હશે તો તે અંગેના વાંધા-સૂચનો ધ્યાને લેવાશે નહીં.
- (7) પરીક્ષામાં હાજર રહેલ ઉમેદવાર જ વાંધા - સૂચન રજૂ કરી શકશે .
- (8) ઉમેદવારે વાંધા-સૂચન સાથે પોતાની જવાબવહીની નકલ બિડાણ કરવાની રહેશે.

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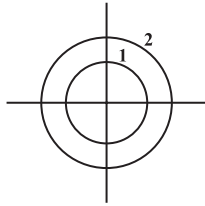
001. The \_\_\_\_\_ of thermodynamics states that if two thermodynamic systems are each in thermal equilibrium with a third system separately are in thermal equilibrium with each other.  
(A) Zeroth Law (B) First Law  
(C) Second Law (Clausius statement) (D) Second Law (Kelvin-Planck statement)
002. There can be no machine which would continuously supply mechanical work without some other form of energy disappearing:  
(A) PMM1 (B) PMM2  
(C) PMM3 (D) Law of availability
003. If temperature of the source is increased, the efficiency of Carnot engine  
(A) Increases (B) Decreases  
(C) Remains Constant (D) First increases and then becomes constant
004. 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) Clausius statement (B) First law of thermodynamics  
(C) Kelvin-Planck statement (D) Conservation of enthalpy
005. For a reversible cycle, the efficiency will depend solely upon:  
(A) Working temperatures (B) Working pressure  
(C) Amount of working fluid (D) Nature of working fluid
006. Following is the intensive property of a thermodynamic system:  
(A) Volume (B) Density  
(C) Temperature (D) Both B and C
007. It is impossible by any procedure, no matter how idealized, to reduce any system to the absolute zero of temperature in a finite number of operations. This is:  
(A) First law of thermodynamics (B) Second law of thermodynamics  
(C) Third law of thermodynamics (D) Law of conservation of energy
008. The criterion of reversibility of a cycle is provided by:  
(A) Clausius inequality (B) Heat Engine  
(C) Reversible isotherms (D) Reversible adiabatics
009. Any thermodynamic process is accompanied by entropy generation. This state is based on:  
(A) First law of thermodynamics (B) Second law of thermodynamics  
(C) Third law of thermodynamics (D) Law of irreversibility

010. The maximum useful work that is obtainable in a process in which the system comes to equilibrium with surrounding is:
- (A) Availability of a given system (B) Anergy of a given system  
(C) Mechanical work of a given system (D) Kinetic energy of a system
011. In which process, heat absorbed or released by a system is zero?
- (A) Isobaric process (B) Isothermic process  
(C) Adiabatic process (D) Isochoric process
012. A Carnot engine works between the temperature  $227^{\circ}\text{C}$  and  $127^{\circ}\text{C}$ . If the work output of the engine is  $10^4\text{ J}$ , then the amount of heat rejected to the sink will be:
- (A)  $1 \times 10^4\text{ J}$  (B)  $2 \times 10^4\text{ J}$   
(C)  $4 \times 10^4\text{ J}$  (D)  $5 \times 10^4\text{ J}$
013. The heat given to an ideal gas in isothermal conditions is used to:
- (A) Increase temperature  
(B) Do external work  
(C) Increase temperature and in doing external work  
(D) Increase internal energy
014. 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
015. What is the source temperature of the Carnot engine in K required to get 70% efficiency? Given sink temperature =  $27^{\circ}\text{C}$ .
- (A) 1000 K (B) 90 K  
(C) 270 K (D) 727 K
016. In a Carnot engine, when the working substance gives heat to the sink
- (A) the temperature of the sink increases  
(B) the temperature of the sink remains the same  
(C) the temperature of the source decreases  
(D) the temperatures of both the sink and the source decrease
017. The heat absorbed or rejected during a polytropic process is
- (A)  $\left(\frac{\gamma-n}{\gamma-1}\right) \times \text{work done}$  (B)  $\left(\frac{\gamma-n}{\gamma-1}\right)^2 \times \text{work done}$   
(C)  $\left(\frac{\gamma-n}{\gamma-1}\right)^{1/2} \times \text{work done}$  (D)  $\left(\frac{\gamma-n}{\gamma-1}\right)^3 \times \text{work done}$

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018. Which of the following is an intensive property of a thermodynamic system?  
(A) Volume (B) Temperature  
(C) Mass (D) Energy
019. An isentropic process is always  
(A) irreversible and adiabatic (B) reversible and isothermal  
(C) frictionless and irreversible (D) reversible and adiabatic
020. Work done in a free expansion process is  
(A) zero (B) minimum  
(C) maximum (D) positive
021. With an increase in the thickness of insulation around a circular pipe, heat loss to the surrounding due to \_\_\_\_\_.  
(A) Convection and conduction decreases  
(B) Convection decreases while that due to conduction increases  
(C) Convection increases while that due to conduction decreases.  
(D) Convection and conduction increases.
022. A stainless-steel tube (thermal conductivity = 19 W/mK) of 2 cm internal diameter and 5 cm outer diameter is insulated with 3 cm thick asbestos (thermal conductivity = 0.2 W/mK). If the temperature difference between the inner most and outermost surfaces is 600°C, the heat transfer rate per unit length is  
(A) 0.94 W/m (B) 9.44 W/m  
(C) 944.7 W/m (D) 9447 W/m
023. The group X and group Y are given as:  
Group X                      Group Y  
P: Biot number              1: Ratio of buoyancy to viscous force  
Q: Grashof number        2: Ratio of inertia to viscous force  
R: Prandtl number         3: Ratio of momentum to thermal diffusivities  
S: Reynolds number       4: Ratio of internal thermal resistance to boundary layer thermal resistance  
The correct match of Group X and Y is:  
(A) P - 4, Q - 1, R - 3, S - 2 (B) P - 4, Q - 3, R - 1, S - 2  
(C) P - 3, Q - 2, R - 1, S - 4 (D) P - 2, Q - 1, R - 3, S - 4
024. A 100 W electric bulb was switched on in a 2.5 m × 3 m × 3 m size thermally insulated room having a temperature of 20°C. The room temperature at the end of 24 hours will be  
(A) 470°C (B) 321°C  
(C) 341°C (D) 450°C

025. Consider two infinitely long thin concentric tubes of circular cross section as shown in figure. If  $D_1$  and  $D_2$  are the diameters of the inner and outer tubes respectively, then the view factor  $F_{22}$  is given by



- (A)  $(D_2/D_1) - 1$   
(B)  $1 - (D_1/D_2)$   
(C) 0  
(D)  $(D_1/D_2)$
026. Which area is used in case of heat flow by conduction through a cylinder?  
(A) Logarithmic mean area  
(B) Arithmetic mean area  
(C) Geometric mean area  
(D) None of these
027. An industrial gas ( $C_p = 1 \text{ kJ/kgK}$ ) enters a parallel flow heat exchanger at  $250^\circ\text{C}$  with a flow rate of  $2 \text{ kg/s}$  to heat a water stream. The water stream ( $C_p = 4 \text{ kJ/kgK}$ ) enters the heat exchanger at  $50^\circ\text{C}$  with a flow rate of  $1 \text{ kg/s}$ . The heat exchanger has an effectiveness of  $0.75$ . The exit temperature of gas stream will be \_\_\_\_\_  
(A)  $100^\circ\text{C}$   
(B)  $175^\circ\text{C}$   
(C)  $75^\circ\text{C}$   
(D)  $150^\circ\text{C}$
028. Water ( $C_p = 4.18 \text{ kJ/kgK}$ ) at  $80^\circ\text{C}$  enters a counter flow heat exchanger with a mass flow rate of  $0.5 \text{ kg/s}$ . Air ( $C_p = 1 \text{ kJ/kgK}$ ) enters at  $30^\circ\text{C}$  with a mass flow rate  $2.09 \text{ kg/s}$ . If the effectiveness of the heat exchanger is  $0.8$ , the LMTD (in  $^\circ\text{C}$ ) is  
(A) 15  
(B) 10  
(C) 20  
(D) 40
029. Two walls of same thickness and cross-sectional area, have thermal conductivities in the ratio of  $4:1$ . If the same temperature difference is maintained across the two faces of both the wall, what is the ratio of heat flow  $Q_1:Q_2$ ?  
(A) 2  
(B) 4  
(C)  $1/2$   
(D)  $1/4$
030. Stefan Boltzmann law applies to heat transfer due to  
(A) Conduction  
(B) Convection  
(C) Radiation  
(D) Thermal conductance and resistance
031. For a given heat transfer rate and for the same thickness, the temperature drop across the material will be maximum for:  
(A) Copper  
(B) Steel  
(C) Aluminum  
(D) Glass wool

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032. If the temperature of a solid surface changes from  $27^{\circ}\text{C}$  to  $627^{\circ}\text{C}$ , its emissive power changes in the ratio of  
(A) 3 (B) 9  
(C) 27 (D) 81
033. Prandtl number is the reciprocal of  
(A) Thermal diffusivity/Momentum diffusivity  
(B) Thermal diffusivity  $\times$  Momentum  
(C) Thermal diffusivity  $\times$  Mass diffusivity  
(D) Momentum diffusivity  $\times$  Mass diffusivity
034.  $\lim_{n \rightarrow \infty} x^n e^{-x}$  is equal to  
(A)  $\infty$  (B) 1  
(C)  $n!$  (D) 0
035. Which of the following is false?  
(A)  $f(a)$  is an extreme value of  $f(x)$  if  $f'(a) = 0$   
(B) If  $f(a)$  is an extreme value of  $f(x)$ , then  $f'(a) = 0$   
(C) If  $f'(a) = 0$  then  $f(a)$  is an extreme value of  $f(x)$   
(D) None of these
036. The value of the integral  $\int_{-2}^2 \frac{dx}{x^2}$  is  
(A) 0 (B) 0.25  
(C) 1 (D)  $\infty$
037. Limit of the following series as  $x$  approaches  $\frac{\pi}{2}$  is  
 $f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$   
(A)  $\frac{2\pi}{3}$  (B)  $\frac{\pi}{2}$   
(C)  $\frac{\pi}{3}$  (D) 1
038.  $\int_0^{\frac{\pi}{2}} \int_0^{\frac{\pi}{2}} \sin(x+y) dx dy$  is  
(A) 0 (B)  $\pi$   
(C)  $\frac{\pi}{2}$  (D) 2
039. The volume of the solid bounded by the ellipsoid  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$  is  
(A)  $\frac{1}{3}\pi abc$  (B)  $\frac{1}{6}\pi abc$   
(C)  $\frac{2}{3}\pi abc$  (D)  $\frac{4}{3}\pi abc$

040. For the scalar field  $u = \frac{x^2}{2} + \frac{y^2}{3}$ , magnitude of the gradient at the point (1, 3) is

- (A)  $\sqrt{\left(\frac{13}{19}\right)}$  (B)  $\sqrt{\left(\frac{9}{2}\right)}$   
 (C)  $\sqrt{5}$  (D)  $\frac{9}{2}$

041. Stokes theorem connects:

- (A) a line integral and a surface integral  
 (B) a surface integral and a volume integral  
 (C) a line integral and a volume integral  
 (D) gradient of a function and its surface integral

042. The volume of an object expressed in spherical co-ordinates is given by

$V = \int_0^{2\pi} \int_0^{\pi/3} \int_0^1 r^2 \sin\theta dr d\theta d\phi$ . The value of the integral is:

- (A)  $\frac{\pi}{3}$  (B)  $\frac{\pi}{6}$   
 (C)  $\frac{2\pi}{2}$  (D)  $\frac{\pi}{4}$

043. By change the order of integration in  $\int_0^8 \int_{x/4}^2 f(x,y) dy dx$  changes to  $\int_t^s \int_p^q f(x,y) dx dy$ ; then q is equal to

- (A)  $4y$  (B)  $16y^2$   
 (C)  $x$  (D)  $8$

044. The area between the parabola  $x^2 = 8y$  and the straight-line  $y = 8$  is

- (A) 85.3 (B) 54.7  
 (C) 216 (D) 226

045. The family  $y = Ax + A^3$  of curves is represented by differential equation of degree

- (A) 1 (B) 2  
 (C) 3 (D) 4

046. The curve for which the slope of the tangent at any point is equal to the ratio of the abscissa to the ordinate of the point is

- (A) ellipse (B) parabola  
 (C) circle (D) rectangular hyperbola

047. The integrating factor of differential equation  $\frac{dy}{dx} + y \tan x - \sec x = 0$  is

- (A)  $\cos x$  (B)  $\sec x$   
 (C)  $e^{\cos x}$  (D)  $e^{\sec x}$

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048. The solution of differential equation  $xdy - ydx = 0$  represents  
(A) a rectangular hyperbola  
(B) parabola whose vertex is at origin  
(C) straight line passing through origin.  
(D) a circle whose centre is at origin.
049. The general solution of the differential equation  $xp^2 - yp + a = 0$  is  
(A)  $xc + yc^2 + a = 0$  (B)  $xc - yc^2 + a = 0$   
(C)  $xc^2 - yc + a = 0$  (D)  $xc^2 - yc - a = 0$
050. The general solution of the differential equation  $(D + 3)(D - 1)^3y = e^x$   
(A)  $(C_1 + C_2x + C_3x^2)e^x + C_4e^{-3x} + \frac{1}{24}x^3e^x$   
(B)  $(C_1e^x + C_2e^{-2x}) + \frac{1}{24}x^3e^x$   
(C)  $(C_1 + C_2x + C_3x^2)e^x + C_4e^{-2x} + \frac{1}{18}x^3e^x$   
(D)  $(C_1e^x + C_2e^{-2x}) + \frac{1}{18}x^3e^x$
051. Solution of differential equation  $(y - px)(p - 1) = p$ , where  $p = \frac{dy}{dx}$  (where  $c$  is any arbitrary constant)  
(A)  $y = cx + \frac{c}{c-1}$  (B)  $y = x^2 + c$   
(C)  $y = cx + 2$  (D)  $y^2 = cx + 3$
052. Complementary function of the differential equation  $(x + a)^2 \frac{d^2y}{dx^2} - 4(x + a) \frac{dy}{dx} + 6y = x$   
(A)  $(C_1x^2 + C_2x^3)$  (B)  $(C_1(x + a)^2 + C_2(x + a)^2)$   
(C)  $(C_1e^{3x} + C_2e^{2x})$  (D) None of the above
053. The value of  $\frac{\partial M}{\partial y}$  and  $\frac{\partial N}{\partial x}$  from  $(x^2 - 2xy + 3y^2)dx + (4y^3 + 6xy - x^3)dy = 0$  is  
(A)  $-2x + 6y$  and  $6y - 2x$  (B)  $8y + 7$  and  $9x + 8$   
(C)  $-2x + 7y$  and  $9x + 8$  (D) None of the above
054. Solution of  $y(a - z)dx + x(a - z)dy + xydz = 0$  is  
(A)  $xy = c(a - z)$  (B)  $xy = ac$   
(C)  $x = c(a - z)$  (D)  $y = c(z - a)$



055. A function which is analytic everywhere in finite complex plane is known as  
 (A) Entire function (B) Holomorphic function  
 (C) meromorphic function (D) None
056. If  $w = u(x, y) + iv(x, y)$  is an analytic function of  $z = x + iy$ , then  $\frac{dw}{dz}$  is equal to  
 (A)  $\frac{\partial w}{\partial x}$  (B)  $-i \frac{\partial w}{\partial x}$   
 (C)  $i \frac{\partial w}{\partial y}$  (D)  $-i \frac{\partial w}{\partial y}$
057. At  $z = 0$ , the function  $f(z) = z^2 \bar{z}$   
 (A) is analytic  
 (B) differentiable  
 (C) doesn't satisfy CR equation  
 (D) Satisfy CR equations but not differentiable
058. There exist no analytic functions  $f$  such that  
 (A)  $\text{Re } f(z) = y - 2x$  (B)  $\text{Re } f(z) = y^2 - 2x$   
 (C)  $\text{Re } f(z) = y^2 - x^2$  (D)  $\text{Re } f(z) = y - x$
059. The mapping  $w = z^2 - 2z - 3$  is  
 (A) conformal within  $|z| = 1$  (B) not conformal at  $z = 1$   
 (C) not conformal at  $z = -1$  and  $z = 3$  (D) everywhere conformal
060. The residue of  $f(z) = \frac{2z+1}{z^2-z-2}$  at  $z = -1$  is  
 (A)  $1/3$  (B)  $3/5$   
 (C)  $2/5$  (D) None of these
061. The value of the integral  $\oint_c \frac{\cos z}{(z-\pi)} dz$ , where  $c$  is  $|z - 1| = 3$  is  
 (A)  $-4\pi i$  (B)  $-2\pi i$   
 (C)  $-4\pi$  (D)  $\pi i$
062. Expansion of  $1/(z^2 - 3z + 2)$  in the region  $1 < |z| < 2$  is  
 (A)  $\frac{-1}{2} \left(1 - \frac{z}{2}\right)^{-1} - \frac{1}{z} \left(1 - \frac{1}{z}\right)^{-1}$  (B)  $\frac{-1}{2} \left(1 - \frac{z}{2}\right)^{-1} + (1 - z)^{-1}$   
 (C) Both (A) & (B) (D) None of these
063. The true state statement about unit of dynamic viscosity is:  
 (A)  $1 \text{ N-Second/m}^2 = 1 \text{ poise}$  (B)  $1 \text{ N-Second/m}^2 = 10 \text{ poise}$   
 (C)  $1 \text{ kN-Second/m}^2 = 1 \text{ poise}$  (D)  $1 \text{ N-Second/m}^2 = 100 \text{ poise}$

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064. Which of the following is a common type of simple manometer?  
(A) Piezometer (B) U-tube manometer  
(C) Single column manometer (D) All of the above
065. Piezometer measures:  
(A) Gauge pressure only (B) Absolute pressure  
(C) Atmospheric pressure (D) All of the above
066. When a static mass of fluid comes in contact with a surface, the point of application of total pressure on the surface is:  
(A) Centre of pressure (B) Centre of mass  
(C) Meta Centre (D) Centre of buoyancy
067. If for a floating body, the meta centre coincides with the centre of gravity of the body, the body will remain in:  
(A) Neutral equilibrium (B) Stable equilibrium  
(C) Unstable equilibrium (D) Cannot predict anything
068. If the streamlines are straight and parallel to each other then:  
(A) There is no acceleration  
(B) There is normal convective acceleration  
(C) There is tangential convective acceleration  
(D) Both (B) and (C)
069. Bernoulli's equation may be derived on the principle of :  
(A) Conservation of volume (B) Conservation of mass  
(C) Conservation of momentum (D) Conservation of energy
070. The formation of vapour and air pockets in liquid results in phenomenon called:  
(A) Erosion (B) Cavitation  
(C) Turbulence (D) Whirling
071. Application based on Bernoulli's equation is:  
(A) Venturi meter (B) Orifice meter  
(C) Nozzle meter (D) All of the above
072. Darcy-Weisbach equation is commonly used for computing:  
(A) Total energy in pipes (B) Loss of head due to friction in pipes  
(C) Loss of streamline flow in pipes (D) None of the above

073. The velocity distribution in a laminar boundary layer is:  
(A) Parabolic (B) Cubic  
(C) Linear (D) Random
074. For complete similarity to exist between the model and its prototype, it should have:  
(A) Geometric similarity (B) Kinematic similarity  
(C) Dynamic similarity (D) All of the above
075. Froude number is ratio of:  
(A) Inertial to Viscous force (B) Inertial to Gravity force  
(C) Inertial to Pressure force (D) Inertial to surface tension force
076. The similitude based on \_\_\_\_\_ finds extensive application in aerodynamic testing:  
(A) Froude model law (B) Euler model law  
(C) Weber model law (D) Mach model law
077. In a turbine, the difference between the head race level and the tail race level when no water is flowing is:  
(A) Gross head (B) Net head  
(C) Effective head (D) None of the above
078. Pelton wheel is a kind of \_\_\_\_\_ turbine:  
(A) Radial flow (B) Tangential flow  
(C) Axial flow (D) Mixed flow
079. In a turbine, all the available energy of water is converted into kinetic energy is known as:  
(A) Impulse turbine (B) Reaction turbine  
(C) Kaplan turbine (D) Francis turbine
080. In the impeller of a \_\_\_\_\_ pump, the liquid flows in the outward radial direction:  
(A) Propeller (B) Centrifugal  
(C) Mixed flow (D) None of the above
081. Following is the positive displacement pump:  
(A) Reciprocating pump (B) Centrifugal pump  
(C) Dynamic pressure pump (D) Rotodynamic pumps
082. The \_\_\_\_\_ is a \_\_\_\_\_ on p-v diagram where all three phases exist in equilibrium:  
(A) Critical state, line (B) Triple point, line  
(C) Triple point, point (D) Vapor dome, line

**M**

083. Which of the following is the cheapest plant in operation and maintenance?  
(A) Thermal power plant (B) Nuclear power plant  
(C) Hydro power plant (D) None of the above
084. Which of the following contributes to the improvement of efficiency of Rankine cycle in a thermal power plant?  
(A) Use of high pressures  
(B) Reheating of steam at intermediate stage  
(C) Regeneration of steam for heating boiler feed water  
(D) All of the above
085. The overall efficiency of the power plant is given by \_\_\_\_\_.  
(A)  $3600/AP$  (B)  $3600/NPHR$   
(C)  $3600/HHV$  (D)  $3600/NTO$
086. Why is deaerator not used in nuclear power plant?  
(A) Not mechanically possible (B) Not economical  
(C) Due to radioactivity (D) None of the above
087. Reflector in nuclear power plants \_\_\_\_\_ neutron leakage.  
(A) Decreases (B) Increases  
(C) Has no effect on (D) Stops
088. Common size unit of steam power plant is  
(A) 500 MW(e) (B) 300 MW(e)  
(C) 250 MW(e) (D) 30 MW(e)
089. Which of the following kind of process does a steam power plant undergo?  
(A) Cyclic (B) Irreversible  
(C) Expansion (D) Adiabatic
090. What is the air standard cycle for a gas-turbine called?  
(A) Reheat cycle (B) Rankine cycle  
(C) Brayton cycle (D) Diesel cycle
091. Which of the following is a type of gas turbine plant?  
(A) Single acting (B) Double acting  
(C) Open (D) None of the above

092. Which of the following is not an advantage of a fire-tube boiler?  
(A) Low first cost (B) Reliability in operation  
(C) More draught required (D) Quick response to load change
093. What is the function of fusible plug installed in the furnace?  
(A) To detect excess current (B) To detect excess heat  
(C) To detect water level in the tube (D) To detect water level in the shell
094. Which of these properties specifies the minimum temperature at which fuel oil can be ignited?  
(A) Pour point (B) Flash point  
(C) Heating value (D) Viscosity
095. The fuel having high self-ignition temperature is desirable in the following:  
(A) SI engine (B) CI engine  
(C) Diesel cycle (D) Both (B) and (C)
096. An air standard cycle which consists of two isothermal and two constant volume processes:  
(A) Lenoir cycle (B) Stirling cycle  
(C) Diesel cycle (D) Otto cycle
097. The \_\_\_\_\_ cycle always has a lower efficiency than the \_\_\_\_\_ of same compression ratio:  
(A) Diesel, Otto (B) Otto, Diesel  
(C) Otto, Dual (D) Dual, Diesel
098. Air standard efficiency of Otto cycle, having bore and stroke of an engine as 17 cm and 30 cm respectively is (take the clearance volume as  $0.001025 \text{ m}^3$ ):  
(A) 50.70 (B) 58.98  
(C) 55.70 (D) 59.92
099. In the abnormal combustion in SI engine, known as detonation:  
(A) The end charge auto-ignites before the flame front reaches it.  
(B) The end charge auto-ignites after the flame front reaches it.  
(C) The end charge does not ignite before the flame front reaches it.  
(D) The end charge does not ignite after the flame front reaches it.
100. Which of the following is effect of detonation?  
(A) Carbon deposits  
(B) Noise and roughness  
(C) Increase in heat transfer  
(D) All of the above

**M**

101. In diesel engine, for smooth running and to maintain the control over the pressure changes:  
(A) The delay period should be as short as possible  
(B) The delay period should be as long as possible  
(C) The delay period has no effect  
(D) None of the above
102. The difference between the indicated power and brake power is known as:  
(A) Friction power (B) Mechanical power  
(C) Combustion efficiency (D) Mechanical efficiency
103. Willan's line method is applicable to the following engine to measure friction power:  
(A) CI engine (B) SI engine  
(C) Both SI and CI engines (D) Multi cylinder engines
104. A mixture of air and water vapour exists at 1 bar pressure and temperature 35°C its relative humidity is 75%. Given that the saturation pressure for water vapour at 35°C is 0.05622 bar, the specific humidity in kJ/kg of dry air is  
(A) 0.29 (B) 0.027  
(C) 0.025 (D) 0.020
105. For air with a relative humidity of 80%  
(A) Dry bulb temperature is less than wet bulb temperature  
(B) Dew point temperature is less than wet bulb temperature  
(C) The dew point and wet bulb temperatures are equal  
(D) The dry bulb and dew point temperatures are equal
106. The COP of domestic refrigerator is  
(A) Equal to 1 (B) Less than 1  
(C) More than 1 (D) None of the above
107. Thermoelectric refrigeration system is based on  
(A) Peltier effect (B) Seebeck effect  
(C) Joule effect (D) None of these
108. Air refrigeration cycle is used in  
(A) Commercial refrigerators (B) Domestic refrigerators  
(C) Gas liquefaction (D) Air conditioning
109. On Psychometric chart, relative humidity lines are  
(A) Vertical (B) Horizontal  
(C) Curved (D) Inclined

110. In the window air conditioner, the expansion device used is  
(A) Capillary tube (B) Thermostatic expansion valve  
(C) Float valve (D) Automatic expansion valve
111. The comfort conditions in air conditioning system are defined by  
(A) 22°C DBT and 60% RH (B) 25°C DBT and 100% RH  
(C) 20°C DBT and 75% RH (D) 27°C DBT and 75% RH
112. Which of the following element of refrigerant is the main contributing factor for ozone depletion?  
(A) Chlorine (B) Fluorine  
(C) Carbon (D) Hydrogen
113. In vapour compression cycle, the refrigerant exists in a superheated vapour state \_\_\_\_\_  
(A) at the exit of the compressor (B) after leaving the expansion valve  
(C) after leaving the evaporator (D) after passing through the condenser
114. The dry bulb temperature during sensible heating of air  
(A) Remains constant (B) Increases  
(C) Decreases (D) None of these
115. Bell Coleman cycle is a  
(A) Reversed Carnot cycle (B) Reversed Otto cycle  
(C) Reversed Joule cycle (D) Reversed Rankine cycle
116. A steel bar of 5 mm is heated from 15 °C to 40 °C and it is free to expand. The bar will induce  
(A) no stress (B) shear stress  
(C) tensile stress (D) compressive stress
117. A bar of copper and steel form a composite system, which is heated to a temperature of 40 °C. The stress induced in the copper bar will be  
(A) tensile (B) compressive  
(C) shear (D) zero
118. The bending moment on a section is maximum where shear force is  
(A) minimum (B) maximum  
(C) changing sign (D) Zero

**M**

119. A simply supported beam 'A' carries a central point load  $W$ . Another beam 'B' is loaded with a uniformly distributed load such that the total load on the beam is  $W$ . The ratio of maximum deflections between beam A and B is
- (A)  $5/8$  (B)  $8/5$   
(C)  $5/4$  (D)  $4/5$
120. The maximum deflection of a fixed beam of length  $L$  carrying a central point load  $W$  is
- (A)  $\frac{WL^3}{48EI}$  (B)  $\frac{WL^3}{96EI}$   
(C)  $\frac{WL^3}{192EI}$  (D)  $\frac{WL^3}{384EI}$
121. The magnitude of shear stress induced in a solid shaft due to applied torque varies
- (A) From maximum at the centre to zero at the circumference.  
(B) From zero at the centre to maximum at the circumference.  
(C) From maximum at the centre to minimum at the circumference and not zero.  
(D) From minimum at the centre and not zero to maximum at the circumference.
122. When a shaft of diameter ( $D$ ) is subjected to a twisting moment ( $T$ ) and a bending moment ( $M$ ), then equivalent bending moment ( $M_e$ ) is given by
- (A)  $\sqrt{M^2 + T^2}$  (B)  $\sqrt{M^2 - T^2}$   
(C)  $\frac{1}{2}(M + \sqrt{M^2 + T^2})$  (D)  $\frac{1}{2}(M + \sqrt{M^2 - T^2})$
123. The hoop stress in a thin cylindrical shell is
- (A) Longitudinal stress  
(B) Compressive stress  
(C) Radial stress  
(D) Circumferential tensile stress
124. Relation amongst Young's modulus ( $E$ ), Poisson's ratio ( $\mu$ ) and Bulk modulus ( $K$ ) is given by
- (A)  $E = 3K(1 - 2\mu)$  (B)  $E = 3K / (1 - 2\mu)$   
(C)  $E = 2K(1 + \mu)$  (D) None of the above
125. A metal pipe of 1 m diameter contains a fluid having a pressure of  $1 \text{ N/mm}^2$ . If the permissible tensile stress in the metal is  $20 \text{ N/mm}^2$ , then the thickness of metal required for making the pipe would be
- (A) 5 mm (B) 10 mm  
(C) 20 mm (D) 25 mm



126. The diameter of shaft A is twice the diameter of shaft B and both are made of the same material. Assuming both the shafts rotate at the same speed, the maximum power transmitted by shaft B is:
- (A) The same as that of shaft A                      (B) Half of shaft A  
(C)  $1/8^{\text{th}}$  of shaft A                                  (D)  $1/4^{\text{th}}$  of shaft A
127. Polar moment of inertia of a hollow circular shaft is equal to
- (A)  $\pi (D^3 - d^3) / 32$                                   (B)  $\pi (D^4 - d^4) / 32$   
(C)  $\pi (D^3 - d^3) / 64$                                   (D)  $\pi (D^4 - d^4) / 64$
128. Torsional rigidity of the shaft is equal to
- (A) product of modulus of rigidity and polar moment of inertia  
(B) sum of modulus of rigidity and polar moment of inertia  
(C) difference of modulus of rigidity and polar moment of inertia  
(D) ratio of modulus of rigidity and polar moment of inertia
129. The principal stresses  $\sigma_1$ ,  $\sigma_2$  and  $\sigma_3$  at a point respectively are 80 MPa, 30 MPa and – 40 MPa. The maximum shear stress is
- (A) 25 MPa    (B) 35 MPa  
(C) 55 MPa    (D) 60 MPa
130. Which one of the following is preferable cross-section of a beam for bending loads?
- (A) Circular    (B) Annular circular  
(C) Rectangular                                        (D) I-section
131. According to the principle of transmissibility of forces, the effect of force on a body is
- (A) same at every point in its line of action  
(B) different at different points in its line of action  
(C) minimum when it acts at the centre of gravity of the body  
(D) maximum when it acts at the centre of gravity of the body
132. A framed structure is said to be perfect if the following correlation exists between the number of joints  $j$  and the number of members  $m$
- (A)  $m = 2j - 3$                                         (B)  $m = 3j - 3$   
(C)  $m = 2j - 1$                                         (D)  $m = j - 2$
133. The centre of gravity of plane lamina will not be at its geometrical centre if it is a
- (A) circle    (B) square  
(C) rectangle                                         (D) right angled triangle

**M**

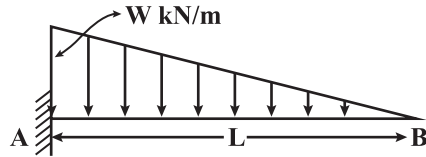
134. When a bullet is fired from a gun, it is recoiled in the backward direction due to  
(A) impulse (B) inertia  
(C) conservation of momentum (D) conservation of energy
135. Strain in a given material is the ratio of  
(A) applied load to the area of cross-section opposing the load  
(B) change in dimension to the original dimension  
(C) applied load to the original dimension  
(D) change in dimension to the area of cross-section opposing the load
136. A sphere P impinges directly onto another identical sphere Q at rest. If the coefficient of restitution is 0.5, the ratio of velocities  $V_q / V_p$  after the impact would be  
(A) 1 : 1 (B) 2 : 1  
(C) 3 : 1 (D) 2 : 3
137. The equivalent length of a column fixed at both the ends is  
(A) 0.7 L (B) 0.5 L  
(C) L (D) 2 L
138. Maximum deflection for a cantilever beam of span L, loaded at free end by force P is given by  
(A)  $PL^2/3EI$  (B)  $PL^2/6EI$   
(C)  $PL^3/8EI$  (D)  $PL^3/3EI$
139. Which of the following materials is highly elastic?  
(A) Rubber (B) Brass  
(C) Steel (D) Glass
140. Match List-I with List-II and select the answer from the codes given below
- | List-I  | List-II                  |
|---|--------------------------|
| (Condition of beam)                                   | (Bending Moment Diagram) |
| a. Subject to bending moment at the end of cantilever | 1. Triangle              |
| b. Cantilever carrying UDL over the whole length      | 2. Cubic curve           |
| c. Cantilever carrying UVL over the whole length      | 3. Parabola              |
| d. Simply supported beam having load at the centre    | 4. Rectangle             |
- Codes:  
(A) a - 4, b - 1, c - 2, d - 3 (B) a - 4, b - 3, c - 2, d - 1  
(C) a - 3, b - 4, c - 2, d - 1 (D) a - 3, b - 4, c - 1, d - 2

141. Generally, on stress-strain plot for steel following points are observed:
- |                      |                     |
|----------------------|---------------------|
| a. Elastic limit     | b. Yield point      |
| c. Ultimate strength | d. Rupture strength |
- What is the right chronology of the appearance of these points during testing?
- |                   |                   |
|-------------------|-------------------|
| (A) d - a - b - c | (B) a - c - b - d |
| (C) a - c - d - b | (D) a - b - c - d |
142. Short columns fail in \_\_\_\_\_.
- |                                    |                   |
|------------------------------------|-------------------|
| (A) combined crushing and buckling | (B) crushing only |
| (C) buckling only                  | (D) bending       |
143. "The algebraic sum of the resolved parts of a number of forces, in a given direction, is equal to resolved part of their resultant in the same direction", The given statement is true for
- |                             |                       |
|-----------------------------|-----------------------|
| (A) Principle of Resolution | (B) Parallelogram law |
| (C) Newton's law            | (D) None of these     |
144. During inelastic collision of two particles, which one of the following is conserved?
- |  |
|--|
| (A) Total linear momentum only                 |
| (B) Total kinetic energy only                  |
| (C) Both linear momentum and kinetic energy    |
| (D) Neither linear momentum nor kinetic energy |
145. 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) $4 \text{ m/s}^2$ | (B) $6 \text{ m/s}^2$  |
| (C) $8 \text{ m/s}^2$ | (D) $10 \text{ m/s}^2$ |
146. A thin rod of length L and mass M will have what moment of inertia about an axis passing through one of its edges and perpendicular to the rod?
- |               |               |
|---------------|---------------|
| (A) $ML^2/12$ | (B) $ML^2/16$ |
| (C) $ML^2/3$  | (D) $ML^2/9$  |
147. A block of mass 5 kg slides down from rest along a frictionless inclined plane that makes an angle of  $30^\circ$  with horizontal. What will be the speed of the block after it covers a distance of 3.6 m along the plane? [ $g = 10 \text{ m/s}^2$ ].
- |           |           |
|-----------|-----------|
| (A) 5 m/s | (B) 6 m/s |
| (C) 7 m/s | (D) 8 m/s |

**M**

148. A tensile test is performed on a round bar. After fracture, it has been found that the diameter remains approximately same at fracture. The material under test was
- (A) Mild steel (B) Cast iron  
(C) Copper (D) Aluminum

149. The maximum bending moment at 'A' for beam shown in the given figure is given by:



- (A)  $wL^4/6$  (B)  $-wL^3/6$   
(C)  $-wL^2/6$  (D)  $wL^2/6$
150. A tensile test is performed on a round bar. After fracture, it has been found that the diameter remains approximately same at fracture. The material under test was
- (A) Mild steel (B) Cast iron  
(C) Copper (D) Aluminium
151. If the principal stresses in a plane stress problem, are  $\sigma_1 = 100$  MPa,  $\sigma_2 = 40$  MPa, the magnitude of the maximum shear stress (in MPa) will be
- (A) 60 (B) 50  
(C) 30 (D) 20
152. The working surface above the pitch surface of the gear tooth is termed as
- (A) Addendum (B) Dedendum  
(C) Flank (D) Face
153. Strain hardening in a ductile material occurs from
- (A) Beginning of loading to yielding (B) Necking to fracture  
(C) Yielding to necking (D) Yielding to fracture
154. A point on a link connecting a double slider crank will trace a
- (A) Ellipse (B) Parabola  
(C) Circle (D) Straight line
155. In a shaper machine, the mechanism for tool feed is
- (A) Geneva mechanism  
(B) Whitworth mechanism  
(C) Ratchet and Pawl mechanism  
(D) None of the above

156. Sensitiveness of a governor is defined as  
(A) Range of speed/ $2 \times$  mean speed  
(B) Mean speed  $\times$  range of speed  
 (C) Range of speed/mean speed  
(D) None of the above
157. In a four-bar mechanism, total number of instantaneous centres of rotation are  
(A) 2 (B) 3  
(C) 4  (D) 6
158. In gear transmission if a heavy reduction 1:75 in speed is desired, what gears will be used?  
(A) Spur gears (B) Helical gears  
 (C) Worm and worm wheel (D) Bevel gears
159. The Coriolis component of acceleration is taken into account for  
(A) Slider crank mechanism (B) Four bar chain mechanism  
 (C) Quick return motion mechanism (D) None of the above
160. For the operating point of the pump, a system characteristic between the head required and the discharge to be maintained is generally expressed as  
(A) Linear equation  (B) Parabolic equation  
(C) Exponential equation (D) Cubic equation
161. A centrifugal pump directly coupled 3kW motor of 1450 rpm speed, is proposed to be connected to a motor of 2900 rpm speed. The power of motor should be  
(A) 6 kW (B) 12 kW  
(C) 18 kW  (D) 24 kW
162. The clearance volume of air compressor is kept minimum because \_\_\_\_\_  
(A) It allows maximum compression to be achieved  
 (B) It greatly affects volumetric efficiency  
(C) It results in minimum work  
(D) It permits isothermal compression
163. An air compressor may be controlled by  
(A) Throttle control (B) Clearance control  
(C) Blow-off control  (D) Any of the above

**M**

164. The intercooling in multistage compressors is done \_\_\_\_\_  
(A) To cool the air during compression (B) To cool the air at delivery  
(C) To enable compression in two stages (D) To minimize the work of compression
165. In material subjected to fluctuating or repeated stress, fracture takes place under a stress whose maximum value is less than the tensile strength of the material. This phenomenon is called  
(A) fatigue (B) creep  
(C) malleability (D) Resilience
166. If the material is heated, its toughness  
(A) increases (B) decreases  
(C) remains same (D) None of the above
167. Machinability of metals depends on  
(A) tensile strength (B) toughness  
(C) hardness (D) both (A) and (B)
168. Ability of a material to undergo large permanent deformation in tension is called  
(A) Toughness (B) Stiffness  
(C) Plasticity (D) Hardness
169. Property of the material due to which it breaks with little permanent distortion is called  
(A) Brittleness (B) Ductility  
(C) Malleability (D) Fatigue
170. The S-N curve for mild steel becomes  
(A) Parabola (B) Horizontal line  
(C) Vertical line (D) None of the above
171. Which of the following is not a theory of fatigue?  
(A) Orowan theory (B) Griffith's theory  
(C) Fatigue limit theorem (D) Wood's theory
172. Which of the following is not a mode of application of force for crack propagation?  
(A) Opening mode (B) Sliding mode  
(C) Tearing mode (D) Rolling mode
173. The curve obtained by plotting the normal and shear stress is called \_\_\_\_\_.  
(A) Stress envelope (B) Strength envelope  
(C) Mohr's envelope (D) Coulomb's envelope

174. According to Coulomb, the relationship between the shear strength and normal stress could be represented by \_\_\_\_\_.
- (A) Linear curve (B) Parabolic curve  
(C) Straight line (D) None of the above
175. Highest value of stress for which Hooke's law is applicable for a given material is
- (A) Stress limit (B) Strain limit  
(C) Proportional limit (D) Significant limit
176. Harness of steel greatly improves with
- (A) Annealing (B) Cyaniding  
(C) Normalizing (D) Tempering
177. Which of the following engineering materials is the most suitable candidate for hot chamber die casting?
- (A) Low carbon steel (B) Titanium  
(C) Copper (D) Tin
178. Which one of the following is a solid-state joining process?
- (A) Gas tungsten arc welding  
(B) Resistance spot welding  
(C) Friction welding  
(D) Submerged arc welding
179. The operation in which oil is permeated into the pores of a powder metallurgy product is known as
- (A) mixing (B) sintering  
(C) impregnation (D) infiltration
180. Cold shut is a casting defect which occurs due to
- (A) excessive pouring temperature of the metal  
(B) insufficient fluidity of the molten metal  
(C) absorption of gases by the liquid metal  
(D) improper alignment of the mould flasks
181. With a solidification factor of  $0.97 \times 10^6 \text{ s/m}^2$ , the solidification time (in seconds) for a spherical casting of 200 mm diameter is
- (A) 539 (B) 1078  
(C) 4311 (D) 3233

**M**

182. In an arc welding process, the voltage and current are 25 V and 300 A respectively. The arc heat transfer efficiency is 0.85 and welding speed is 8 mm/sec. The net heat input (in J/mm) is  
(A) 64 (B) 797  
(C) 1103 (D) 79700
183. The strength of a brazed joint  
(A) decreases with increase in gap between the two joining surfaces  
(B) increases with increase in gap between the two joining surfaces  
(C) decreases up to certain gap between the two joining surfaces beyond which it increases  
(D) increases up to certain gap between the two joining surfaces beyond which it decreases
184. The pattern used for making three dimensional moulds is  
(A) Match plate pattern (B) Follow board pattern  
(C) Sweep pattern (D) Loose piece pattern
185. Match the following non-traditional machining processes with the corresponding material removal mechanisms:
- | Machining process              | Mechanism of material removal |
|--------------------------------|-------------------------------|
| P. Chemical machining          | 1. Erosion                    |
| Q. Electro-chemical machining  | 2. Corrosive reaction         |
| R. Electro-discharge machining | 3. Ion displacement           |
| S. Ultrasonic machining        | 4. Fusion and vaporization    |
- (A) P - 2, Q - 3, R - 4, S - 1 (B) P - 2, Q - 4, R - 3, S - 1  
(C) P - 3, Q - 2, R - 4, S - 1 (D) P - 2, Q - 3, R - 1, S - 4
186. AJM is used where \_\_\_\_\_.  
(A) materials are heat sensitive  
(B) thin sections of hard material are produced  
(C) intricate holes, which are difficult to be produced by other machining processes, are to be made  
(D) All of the above
187. In which of the following machining processes the metal of a work piece is dissolved?  
(A) Electro-discharge machining (B) Ultrasonic machining  
(C) Electro-chemical machining (D) Chemical machining
188. In ultrasonic drilling process, the tool is usually given  
(A) Rotary motion  
(B) Reciprocating motion  
(C) Linear motion  
(D) Both rotary and reciprocating motions



189. Reverse of electro-plating process is  
(A) EDM (B) ECM  
(C) ECG (D) LBM
190. USM process is used for machining  
(A) Hard metals (B) Brittle metals  
(C) Conduction (D) All of these
191. Seamless tubes are made by  
(A) Piercing operation (B) Hot forging  
(C) Power rolling (D) None of these
192. In EDM, the tool is made of  
(A) Cast iron (B) Copper  
(C) Brass (D) All of these
193. The term allowance in limits and fits is usually referred by  
(A) Minimum clearance between shaft and hole  
(B) Maximum clearance between shaft and hole  
(C) Difference of tolerance at shaft and hole  
(D) Difference between maximum and minimum size of hole
194. 20H7-g6 is a  
(A) Clearance fit (B) Push fit  
(C) Transition fit (D) Interference fit
195. Two slip gauges of 10 mm width measuring 1.000 mm and 1.015 mm are kept side by side in contact with each other lengthwise. An optical flat is kept resting on them and inspected using monochromatic light of wavelength 0.0058928 mm. The total number of straight fringes that can be observed on both slip gauges will be  
(A) 4 (B) 6  
(C) 3 (D) 8
196. According to Taylor's principle, No Go gauge checks  
(A) Only important dimensions at a time (B) All the dimensions at a time  
(C) Only one feature at a time (D) Only related dimensions at a time
197. Expressing a dimension as 42.5/42.3 mm is the case of  
(A) Unilateral tolerance (B) Bilateral tolerance  
(C) Limiting dimensions (D) None of the above

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198. The most accurate instrument among the following is  
(A) Vernier caliper (B) Screw gauge  
(C) Slip gauge (D) Optical projector
199. A 30h7 shaft has the dimension limits  
(A) 30.000, 29.979 (B) 30.000, 30.021  
(C) 30.000, 30.007 (D) 30.000, 29.993
200. What is the effect of wear on the size of 'Go' snap gauges?  
(A) Decrease (B) Increase  
(C) May increase or decrease (D) No effect
201. Which deviations are provided to a new 'Go' plug gauge from the nominal size  
(A) One positive deviation (B) One negative deviation  
(C) Two positive deviations (D) Two negative deviations
202. When setting up a mechanical drawing in AutoCAD the drafter should set the units to \_\_\_\_  
(A) Metric (B) Decimal  
(C) Fractional (D) Architectural
203. In a CNC Program Block N10 G02 G91 X52 Z25 ... G02 represents:  
(A) Linear interpolation (B) Clockwise circular interpolation  
(C) Incremental command (D) Absolute command
204. Which one of the following is not Extrusion-based Rapid Prototyping Systems?  
(A) Fused Deposition Modelling (B) 3D Printing  
(C) Laminated Object Manufacturing (D) Electron Beam melting
205. What is the format for the prototyping machine file?  
(A) .prt (B) .slt  
(C) .stl (D) .iges
206. Feed is measured in units of  
(A) Length/revolution (B) Degree/revolution  
(C) Length (D) Velocity
207. NC contouring is an example of  
(A) Continuous path positioning  
(B) Point-to-point positioning  
(C) Absolute positioning  
(D) Incremental positioning

208. The two-dimensional translation equation in the matrix form is  
(A)  $P' = P + T$  (B)  $P' = P - T$   
(C)  $P' = P * T$  (D)  $P' = P$
209. What key hardware item ties a CAD/ CAM system together?  
(A) Mouse (B) Graphics workstation  
(C) Digitizer (D) Plotter
210. SCADA stands for \_\_\_\_\_.  
(A) Supervisory control and data acquisition system  
(B) Superior control and data acquisition system  
(C) Supervisory control and data appear system  
(D) None of the above
211. XY Plane Selection in CNC machining is done by  
(A) G16 (B) G17  
(C) G18 (D) G19
212. In which system we get feedback?  
(A) Open-loop system (B) Machine control system  
(C) Closed-loop system (D) None of the above
213. The lost motion in CNC machine tool is on account of:  
(A) Backlash in gearing (B) Wind-up of drive shafts  
(C) Deflection of machine tool members (D) All of the mentioned
214. Up and down motion along an axis is known as \_\_\_\_ in robotics  
(A) Pitch (B) Roll  
(C) Yaw (D) None of the above
215. CIM (Computer Integrated Manufacturing) is a kind of \_\_\_\_\_.  
(A) Extension of CAM  
(B) Link between CAD and CAM  
(C) Management philosophy  
(D) Industrial functioning too
216. A key connecting a flange coupling to a shaft is likely to fall in  
(A) Shear (B) Tension  
(C) Torsion (D) Bending

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217. Creep in transmission belt is due to  
(A) Plastic deformation of belt material due to constant use  
(B) Elasticity of belt material  
(C) Plasticity of the belt material  
(D) Difference in belt tension on two sides of a pulley
218. When two springs are in series having stiffness 20 N/m and 30 N/m, the equivalent stiffness will be  
(A) 16  
(B) 14  
(C) 12  
(D) 10
219. Shape of Woodruff key is like  
(A) Semicircle  
(B) Cylinder  
(C) Sphere  
(D) Trapezoid
220. The rated life of a ball bearing varies inversely to  
(A) Load  
(B) Load<sup>2</sup>  
(C) Load<sup>3</sup>  
(D) Load<sup>4</sup>
221. Two parallel shafts are 330 mm apart. Power is transmitted from one shaft to other by gear drive. The pinion runs  $\frac{8}{3}$  times as fast as the wheel. If the module of the meshing gears is 6 mm then the number of teeth in the pinion is  
(A) 30  
(B) 45  
(C) 60  
(D) 80
222. The dynamic load carrying capacity of a roller bearing is 20 kN. The desired life for 90% survival of the bearing is 8000 hours at a speed of 6000 rpm. The equivalent radial load the bearing can carry is  
(A) 3.658 kN  
(B) 4.923 kN  
(C) 5.168 kN  
(D) 6.734 kN
223. Which of the following is the criterion in the design of hydrodynamic journal bearing?  
(A) Sommerfeld number  
(B) Rating life  
(C) Special dynamic capacity  
(D) Rotation factor
224. Two mating spur gears have 50 and 120 teeth respectively. The pinion rotates at 1100 rpm and transmit a torque of 20 Nm. The torque transmitted by gear is  
(A) 6.6 Nm  
(B) 48 Nm  
(C) 40 Nm  
(D) 60 Nm

225. A 70 mm long and 8 mm size fillet weld carries a steady load of 15 kN along the weld. The shear strength of the weld material is equal to 200 MPa. The factor of safety is  
(A) 2.4 (B) 5.28  
(C) 4.8 (D) 6.8
226. A cotter joint is used to transmit  
(A) Axial tension force  
(B) Axial tensile or compressive force  
(C) Axial compressive force  
(D) Combined bending and torsional moments
227. For self-locking of screws, the efficiency cannot be more than  
(A) 40% (B) 50%  
(C) 90% (D) 20%
228. 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  $180^\circ$ , the coefficient of friction required between drum and belt is  
(A) 0.20 (B) 0.25  
(C) 0.30 (D) 0.35
229. The current in the intrinsic semiconductor is mainly due to  
(A) holes in the valence band (B) thermally generated electrons  
(C) conduction band electrons (D) electrons in the valence band
230. The drift velocity of electrons in silicon  
(A) Is proportional to the electric field for all values of electric field  
(B) Is independent of the electric field  
(C) Increases at low values of electric field and decreases at high values of electric field exhibiting negative differential resistance  
(D) Increases linearly with electric field and gradually saturates at higher values of electric field
231. In a P-type Si sample the hole concentration is  $2.25 \times 10^{15}/\text{cm}^3$ . The intrinsic carrier concentration is  $1.5 \times 10^{10}/\text{cm}^3$  the electron concentration is  
(A) Zero (B)  $10^{10}/\text{cm}^3$   
(C)  $10^5/\text{cm}^3$  (D)  $1.5 \times 10^{25}/\text{cm}^3$
232. Silicon PN junction at a temperature of  $200^\circ\text{C}$  has a reverse saturation current of 10 pA. The reverse saturation current at  $400^\circ\text{C}$  for the same bias is approximately  
(A) 20 pA (B) 30 pA  
(C) 40 pA (D) 80 pA

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233. The maximum number of electrons the N shell can have is \_\_\_\_\_.

- (A) 8 (B) 18  
(C) 32 (D) 16

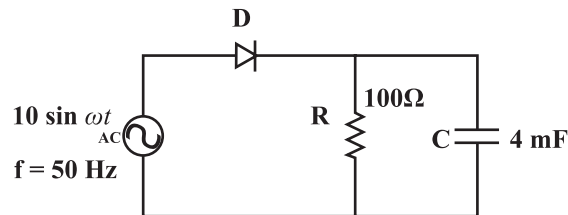
234. Semiconductors have \_\_\_\_\_ conduction band and \_\_\_\_\_ valence band.

- (A) A lightly filled; a moderately filled (B) an almost filled; a moderately filled  
(C) an almost empty; an almost filled (D) an almost filled; an almost empty

235. The forbidden energy gap for germanium is

- (A) 0.12 eV (B) 0.72 eV  
(C) 1.11 eV (D) 1.52 eV

236. The figure shows a half-wave rectifier. The diode D is ideal. The average steady-state current (in Amperes) through the diode is approximately \_\_\_\_



- (A) 2 A (B) 1 A  
(C) 0.1A (D) A

237. In a rectifier, larger the value of shunt capacitor filter

- (A) Larger the peak-to-peak value of ripple voltage  
(B) Larger the peak current in the rectifying diode  
(C) Longer the time that current pulse flows through the diode  
(D) Smaller the dc voltage across the load

238. The basic reason why a full wave rectifier has twice the efficiency of a half wave rectifier is that

- (A) it makes use of transformer  
(B) its ripple factor is much less  
(C) it utilizes both half-cycle of the input  
(D) its output frequency is double the line frequency

239. A BJT with  $\beta = 50$  has a base to collector leakage current  $I_{CBO}$  of  $2.5 \mu\text{A}$ . If the transistor is connected in CE configuration, the collector current for  $I_B = 0$  is

- (A) 0.05 mA (B) 0.1275 mA  
(C) 0.157 mA (D) 0.0289 mA

240. BJT is a \_\_\_\_
- (A) Voltage controlled device  
(B) Current controlled device  
(C) Very high input impedance device  
(D) None of the above
241. Early effect in BJT refers to
- (A) Avalanche breakdown  
(B) Thermal breakdown  
(C) Base narrowing  
(D) Zener breakdown
242. A bipolar junction transistor is used as power control switch by biasing it in the cut-off region (OFF state) or in the saturation region (ON state). In the ON state, for the BJT
- (A) Both the base-emitter junction and base-collector junctions are reverse biased  
(B) The base-emitter is reverse biased, and the base-collector junction is forward biased  
(C) The base-emitter junction is forward biased, and the base-collector junction is reverse biased  
(D) Both the base-emitter and base-collector junctions are forward biased
243. The number of depletion layers in a transistor is \_\_\_\_.
- (A) Two  
(B) Three  
(C) Four  
(D) Five
244. The CE amplifier circuit are preferred over CB amplifier circuit because they have
- (A) Lower amplification factor  
(B) Larger amplification factor  
(C) High input resistance and low output resistance  
(D) None of these
245. In CB configuration, the output V- I characteristics of the transistor are drawn by taking
- (A)  $V_{CB}$  vs.  $I_C$  for constant  $I_E$   
(B)  $V_{CB}$  vs.  $I_E$  for constant  $I_C$   
(C)  $V_{CB}$  vs.  $I_E$  for constant  $I_B$   
(D)  $V_{CB}$  vs.  $I_B$  for constant  $I_E$
246. A thin P-type silicon sample is uniformly illuminated with light which generates excess carriers. The recombination rate is directly proportional to
- (A) The minority carrier mobility  
(B) The minority carrier recombination lifetime  
(C) The majority carrier concentration  
(D) The excess minority carrier concentration

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247. In a multi-stage RC-Coupled Amplifier the coupling capacitor
- (A) Limits the low frequency response
  - (B) Limits the high frequency response
  - (C) Does not affect the frequency response
  - (D) Blocks the d.c components without effecting the frequency response
248. What is true with regard to the cut-off region of npn BJT?
- (A)  $V_B > V_E$
  - (B)  $V_B < V_E$
  - (C)  $V_B = V_E$
  - (D)  $V_B > V_C$
249. Under low level injection assumption, the injected minority carrier current for an extrinsic semiconductor is essentially the
- (A) Diffusion current
  - (B) Drift current
  - (C) Recombination current
  - (D) Induced current
250. The impurity commonly used for realizing the base region of a silicon n-p-n transistor is
- (A) Gallium
  - (B) Indium
  - (C) Boron
  - (D) Phosphorus
251. In a uniformly doped abrupt PN junction, the doping level of the N-side is four times the doping lev of the P-side. Then the ratio of the depletion layer widths is
- (A)  $W_n / W_p = 1/8$
  - (B)  $W_n / W_p = 1/6$
  - (C)  $W_n / W_p = 1/4$
  - (D)  $W_n / W_p = 1/2$
252. A PN junction with a  $100 \Omega$  resistor is forward biased so that a current of 100 mA flows. If the voltage across this combination is instantaneously reversed to 10 volts at  $t = 0$ , the reverse current that flows through the diode at  $t = 0$  is approximately given by
- (A) 0 mA
  - (B) 100 mA
  - (C) 200 mA
  - (D) 50 mA
253. In a Zener diode,
- (A) Only P-region is heavily doped
  - (B) Only N-region is heavily doped
  - (C) Both P and N-regions are heavily doped
  - (D) Both P and N-regions are lightly doped
254. A transistor connected in a common base configuration has the following readings  $I_E = 2 \text{ mA}$  and  $I_B = 20 \mu\text{A}$ . Find the current gain  $\alpha$
- (A) 0.95
  - (B) 1.98
  - (C) 0.99
  - (D) 0.98



255. The breakdown voltage of a transistor with its base open is  $BV_{CEO}$  that with emitter open is  $BV_{CBO}$  then
- (A)  $BV_{CEO} = BV_{CBO}$  (B)  $BV_{CEO} > BV_{CBO}$   
(C)  $BV_{CEO} < BV_{CBO}$  (D)  $BV_{CEO}$  not related to  $BV_{CBO}$
256. The Ebers-Moll model is applicable to
- (A) Bipolar junction transistors (B) MOS transistors  
(C) Unipolar Junction transistors (D) Junction field effect transistors
257. The \_\_\_\_\_ region has the highest area in the transistor.
- (A) Collector (B) Base  
(C) Base emitter (D) Emitter
258. Drift current in semiconductors depends upon
- (A) Only the electric field  
(B) Only the carrier concentration gradient  
(C) Both the electric field and the carrier concentration  
(D) Both the electric field and the carrier concentration gradient
259. If the base width in a bipolar junction transistor is doubled, which one of the following statements will be TRUE?
- (A) Current gain will increase  
(B) Unity gain frequency will increase  
(C) Emitter base junction capacitance will increase  
(D) Early voltage will increase
260. Which one is disadvantage of impedance matching?
- (A) Gives low power output (B) Gives distorted output  
(C) Requires a transformer (D) Generates electrical power
261. Which of the following are the functions of a transistor?
- (A) Rectifier and a fixed resistor  
(B) Switching device and a fixed resistor  
(C) Tuning device and rectifier  
(D) Variable resistor and switching device.
262. Operations research is the application of methods to arrive at the optimal solutions to the problems.
- (A) Economical (B) Scientific  
(C) Statistical (D) Artistic

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263. If the  $i$ th constraint of a primal (maximization) is equality, then the dual (minimization) variable ' $y_i$ ' is:
- (A)  $\geq 0$  (B)  $\leq 0$   
(C)  $= 0$  (D) Unrestricted in sign
264. The time by which the activity completion time can be delayed without affecting the start of succeeding activities is known as
- (A) Duration (B) Total float  
(C) Free float (D) Interfering float
265. In Degenerate solution value of objective function
- (A) Increases infinitely (B) Basic variables are non-zero  
(C) Decreases infinitely (D) One or more basic variables are zero
266. \_\_\_\_\_ or \_\_\_\_\_ are used to "balance" an assignment or transportation problem.
- (A) Destinations; sources (B) Units supplied; units demanded  
(C) Dummy rows; dummy columns (D) Artificial cells; degenerate cells
267. Activities A, B, and C are the immediate predecessors for Y activity. If the earliest finishing time for the three activities are 12, 15, and 10, then what will be the earliest starting time for Y?
- (A) 10 (B) 15  
(C) 12 (D) 18.5
268. Which of the following is a method for improving an initial solution in a transportation problem?
- (A) Northwest-corner  
(B) Vogel's approximation method  
(C) Southeast-corner rule  
(D) Stepping-stone method
269. Resource smoothing means
- (A) Optimization and economical utilization of resources  
(B) Gradual increase in resources  
(C) Adjustment of resources to have the least variations.  
(D) Complete revamping of resources to suit the requirements.
270. The solution to a transportation problem with ' $m$ ' rows (supplies) & ' $n$ ' columns (destination) is feasible if number of positive allocations are
- (A)  $m - n + 1$  (B)  $m * n * 1$   
(C)  $m + n - 1$  (D)  $m + n + 1$

271. The Operations research technique which helps in minimizing total waiting and service costs is  
(A) Queueing Theory (B) Decision Theory  
(C) Game Theory (D) Network Theory
272. Pessimistic time and optimistic time of completion of an activity are given as 10 days and 4 days respectively, the variance of the activity will be:  
(A) 1 (B) 6  
(C) 12 (D) 18
273. In PERT the activity distribution is  
(A) Binomial (B) Normal  
(C) Poisson (D) Beta
274. A minimal spanning tree in network flow models involves  
(A) All the nodes with cycles/loop allowed  
(B) All the nodes with cycle/loop not allowed  
(C) Shortest path between start and end nodes  
(D) All the nodes with directed areas
275. Customers arrive at a reception counter at an average interval rate of 10 minutes and the receptionist takes an average of 6 minutes for one customer. Determine the average queue length.  
(A) 9/10 (B) 7/10  
(C) 11/10 (D) 3/10
276. The primary objective of crashing in CPM is  
(A) To decrease project duration (B) To decrease cost  
(C) To increase cost (D) To optimise the path
277. The method used for solving an assignment problem is called  
(A) Reduced matrix method (B) MODI method  
(C) Hungarian method (D) Graphical method
278. If an opportunity cost value is used for an unused cell to test optimality, it should be  
(A) Equal to zero (B) Most negative number  
(C) Most positive number (D) Any value
279. If  $x$  is a decision variable of LPP and unrestricted in sign then this variable can be converted into  $x = x' - x''$  so as to solve the LPP by simplex method, where:  
(A)  $x' \leq 0$  and  $x'' \geq 0$  (B)  $x' \geq 0$  and  $x'' \leq 0$   
(C)  $x' \geq 0$  and  $x'' \leq 0$  (D)  $x' \geq 0$  and  $x'' \geq 0$

**M**

280. A PERT network has 9 activities on its critical path. The standard deviation of each activity on the critical path is 3. The standard deviation of the critical path is  
(A) 3 (B) 9  
(C) 81 (D) 27
281. For a salesman who has to visit  $n$  cities which of the following are the ways of his tour plan?  
(A)  $n!$  (B)  $(n + 1)!$   
(C)  $(n - 1)!$  (D)  $n$
282. In construction project planning, free float can affect which of the following?  
(A) Only that particular activity (B) Succeeding activity  
(C) Overall completion (D) Preceding activity
283. In Lead Acid Batteries, the Electrolyte used is  
(A) Sulphuric Acid (B) Hydrochloric acid  
(C) Nitric acid (D) Acetic acid
284. A robot can do the following:  
(A) Spot welding (B) Palletizing  
(C) Machine loading/unloading (D) All of the above
285. Electron beam machining is a process which can be categorised as:  
(A) Thermal energy based process (B) Mechanical energy based process  
(C) Chemical energy based process (D) Electro-chemical process
286. \_\_\_\_\_ braking is used where, load on the motor has very high inertia (e.g in electric trains).  
(A) Rheostatic (B) Plugging  
(C) Coasting (D) Regenerative
287. Automated assembly lines are an example of:  
(A) Fixed automation (B) Programmable automation  
(C) Flexible automation (D) All of the above
288. Electric vehicles and hybrid vehicles have following components common except  
(A) Battery (B) ECU  
(C) Generator (D) Internal Combustion Engine
289. Quantum wire is a  
(A) 1 - D structure (B) 2 - D structure  
(C) 3 - D structure (D) 0 - D structure



**M**

298. Advantages of lithium batteries

- (A) Light weight (B) Compact  
(C) Low maintenance (D) All of the above

299. Which of the following is not an example of a fuel cell?

- (A) Hydrogen-oxygen cell (B) Methyl-oxygen-alcohol cell  
(C) Propane-oxygen cell (D) Hexanone-oxygen cell

300. The most accurate robot is

- (A) Cartesian robot (B) Polar robot  
(C) Spherical robot (D) Articulated
-