Question Booklet Series: A *Serial No.* 140627

PULEET-2014

Important: *Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.*

Roll No. *In Figure* *In Words*

O.M.R. Answer Sheet Serial No.

Signature of the Candidate _____

Time: 90 minutes **Number of Questions: 75** **Maximum Marks : 75**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO

INSTRUCTIONS

1. Write your roll No. on the Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Code Nos of Question Booklet on the OMR answer Sheet. Darken the corresponding bubbles with **Black Ball Point/Black Gel Pen.**
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. To open the Question Booklet remove the seal gently when asked to do so.
5. Please check that this Question Booklet contains 75 questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of test.
6. Each question has four alternative answer (A, B, C, D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point/Black Gel Pen.** There shall be negative marking for wrong answers.
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions given in the Question Booklet.
9. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
10. For rough work only the blank sheet at the end of the Question Booklet be used.
11. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. Any **resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
12. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
13. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/ noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
14. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
15. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculators is not allowed.**

PULEET-2014

1. The rank of the matrix $A = \begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}$ is ___.

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

2. The angle between any two diagonals of a cube is ___.

   (A) $\pi/3$ (B) π (C) $\cos^{-1}(1/3)$ (D) $\cos^{-1}(0.5)$

3. Find the limit of the function $\tan^{-1}\left(\frac{|x|+|y|}{x^2+y^2}\right)$.

   (A) Does not exist (B) $\pi/2$ (C) 0 (D) 1

4. The plane $x = 1$ intersects the paraboloid $z = x^2 + y^2$ in a parabola. Find the slope of the tangent to the parabola at (1,2,5).

   (A) 1 (B) 2 (C) 4 (D) 0

5. Find the points on the curve $xy^2 = 54$ nearest to origin.

   (A) $(2, \pm\sqrt{27})$ (B) $(54, 1)$ (C) $(3, \pm 3\sqrt{2})$ (D) None of these

6. The general solution of differential equation $x\,dy - y\,dx = x\sqrt{x^2 - y^2}\,dx$ is ___.

   (A) $y = \cos(x) + c$ (B) $y = x\sin(x + c)$ (C) $y = x$ (D) $y = \tan(x + c)$

7. The region in the first octant enclosed by the parabola $y = x^2$, the y-axis, and the line $y = 1$ is revolved about the line $x = 3/2$ to generate a solid. Find the volume of the solid.

   (A) $\pi/2$ (B) 2π (C) $3\pi/2$ (D) 4

8. Find the area enclosed by one leaf of rose $r = 12\cos(3\theta)$.

   (A) π (B) 2π (C) 4π (D) 12π

9. Find the derivative of $f(x, y) = xe^y + \cos(xy)$ at the point $(2, 0)$ in the direction of $\vec{A} = 3\,\hat{i} - 4\,\hat{j}$.

   (A) -1 (B) 3 (C) 1 (D) 0

10. Find the curvature for the space curve $\vec{r} = 3\sin t\,\hat{i} + 3\cos t\,\hat{j} + 4t\,\hat{k}$.

    (A) 1/10 (B) 3/25 (C) 0 (D) 2/9

11. Find the value of $\int_{(1,1,1)}^{(2,3,-1)} ydx + xdy + 4dz$ over the line segment from $(1, 1, 1)$ to $(2, 3, -1)$.

    (A) 0 (B) 3 (C) 5 (D) -3

12. Find the value of $\oint_C \left[\ln(x)\ \sin(y)\ dy - \frac{\cos y}{x} dx\right]$ for any closed curve.

(A) 1 (B) π (C) 0 (D) -1

13. Find the value of $\int\int_S \vec{F} \cdot \hat{n}\ d\sigma$ for $\vec{F} = x\,\hat{i} + y\,\hat{j} + z\,\hat{k}$ over the sphere $x^2 + y^2 + z^2 = a^2$.

A) $\frac{4}{3}\pi a^3$ (B) $4\pi a^3$ (C) 0 (D) $4\pi a^2$

14. Find the unit tangent vector of the helix $\vec{r} = \cos t\,\hat{i} + \sin t\,\hat{j} + t\,\hat{k}$.

(A) $\hat{i}$ (B) $-\sin t\,\hat{i} + \cos t\,\hat{j}$ (C) $-\frac{\sin t}{\sqrt{2}}\,\hat{i} + \frac{\cos t}{\sqrt{2}}\,\hat{j} + \frac{1}{\sqrt{2}}\,\hat{k}$ (D) $-\hat{i}$

15. If a vector field $\vec{F}$ is irrotational, the $\nabla \times \vec{F} =$ _____.

(A) 0 (B) π (C) -1 (D) 1

16. A current of 1 Ampere is passed through water for certain duration to liberate 1 g of oxygen. A little amount of sulphuric acid has been added to water to make it conducting. Given Faraday constant = 96500 C/mole. The time taken for the process is

(A) 96500 seconds (B) 1608 minutes

(C) 1200 minutes (D) 201 minutes

17. Two long, straight wires lying parallel in a plane carry electric current of 10 A each in opposite directions. The separation between the wires is 5.0 cm and permeability of the medium is $4\pi \times 10^{-7}$ T-m/A. The magnetic field at a point P midway between the wires is

(A) 80×10^{-6} T (B) $10\pi \times 10^{-6}$ T

(C) 16×10^{-5} T (D) Zero

18. A parallel-plate capacitor of capacitance 100 μF is connected to a power supply of 200 V. A dielectric slab of dielectric constant 5 is now inserted into the gap between the plates. The work done by the power supply in additional charging of the capacitor is

(A) 50,000 ergs (B) 10 J (C) 20 J (D) 16 J

19. A bar of copper of length 75 cm and a bar of steel of length 125 cm are joined together end-to-end. Both are of circular cross section with diameter 2 cm. The free ends of the copper and steel bars are maintained at 100°C and 0°C, respectively. The curved surfaces of the bars are thermally insulated from the surroundings. Given that the thermal conductivity of copper is 360 W m^{-1} $°C^{-1}$ and that of steel is 45 W m^{-1} $°C^{-1}$. The temperature of the copper-steel junction is

(A) 93°C (B) 50°C (C) 37.5 °C (D) 62.5 °C

20. A monoatomic ideal gas initially at temperature T_1 is enclosed in a cylinder fitted with a friction piston. The gas is allowed to expand adiabatically to a temperature T_2 by releasing the piston suddenly. If L_1 and L_2 are lengths of gas columns before and after expansion, respectively. The ratio of temperatures, T_1/T_2, is given by

(A) $(L_1/L_2)^{2/3}$ (B) $(L_1/L_2)^{5/3}$ (C) $(L_2/L_1)^{5/3}$ (D) $(L_2/L_1)^{2/3}$

21. Two metallic spheres S_1 and S_2 are made of same material and have got identical surface finish. The mass of S_1 is thrice of that of S_2. Both of the spheres are heated to the same high temperature and placed in the same room having lower temperature. Both the spheres are thermally insulated from each other. The ratio of initial rate of cooling of S_1 and S_2 is

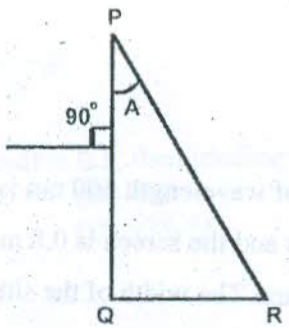
(A) $3^{-1/3}$

(B) $3^{-1/2}$

(C) $3^{-2/3}$

(D) $3^{1/2}$

22. A beam of light consisting of three colours is incident on a right angled prism, as shown. The refractive indices of the material of the prism for these colours are 1.40, 1.45 and 1.48. At least one colour is to be separated from the other two after transmission from the face PR. The value of the angle of prism for this to happen will be



(A) 30°

(B) 45°

(C) 60°

(D) 75°

23. Stationary waves are set up by the superposition of two waves given by,

$y_1 = 0.05 \sin(5\pi t - x)$ and $y_2 = 0.05 \sin(5\pi t + x)$

where x and y are in meters and t is in sec. The amplitude of the superimposed wave is represented by

(A) $0.05 \sin x$

(B) $0.1 \cos x$

(C) $0.1 \sin x$

(D) $0.1 \sin(5\pi t - x)$

24. A SONAR system fixed in submarine 'A' operates at a frequency 40.0 kHz. The speed of sound in sea water is 1500 m/sec. An enemy submarine 'B' moves towards the SONAR system with a speed of 100 m/sec. The frequency of sound wave reflected by the submarine 'B' as detected by the SONAR system fixed in submarine 'A' will be

(A) 45.7 kHz

(B) 42.8 kHz

(C) 40.0 kHz

(D) 47.8 kHz

25. An automobile moves on a road with a speed of 15 m/s. The radius of its wheels is 0.35 m. The moment of inertia of the wheel about its axis of rotation is 3 kg m^2. If the vehicle is to be brought rest in 15 s, the average negative torque transmitted by brakes to a wheel is

(A) 10.67 kg m^2 s^{-2}

(B) 11.67 kg m^2 s^{-2}

(C) 8.57 kg m^2 s^{-2}

(D) 6.57 kg m^2 s^{-2}

26. Two polaroids 'A' and 'B' are placed with their optic axes 90^0 to each other. (N-1) more polaroi are inserted between the two crossed polaroids 'A' and 'B' such that the angle between the optic axes of successive polaroids in the whole set is equal. If unpolarised light is made to fall, the rati of the transmitted light intensity to incident light intensity is given by

(A) $\left[cos\left(\frac{\pi}{2N}\right)\right]^{2N}$

(B) $\left[cos\left(\frac{\pi}{2}\right)^{N}\right]^{2(N+1)}$

(C) $\left[cos\left(\frac{\pi}{2N}\right)\right]^{2(N-1)}$

(D) $\left[cos\left(\frac{\pi}{2N}\right)\right]^{2(N+1)}$

27. A parallel beam of light of wavelength 600 nm is incident normally on a slit of width 'd'. The distance between the slits and the screen is 0.8 m. The distance of second order maximum from t central maximum is 15 mm. The width of the slit 'd' is

(A) 80 μm

(B) 160 μm

(C) 48 μm

(D) 30 μm

28. The half-life of ^{198}Au is 2.31 d. The atomic weight of ^{198}Au is 198 g/mol. The activity of 1.00 mg ^{198}Au is

(A) 300 Bq

(B) 3.0×10^8 Bq

(C) 1.05×10^{13} Bq

(D) 1.05×10^{23} Bq

29. An X-ray tube is operated at 20 kV and the current through the tube is 0.5 mA. The cutoff wavelength of the continuous bremsstrahlung spectrum emitted from the tube will be

(A) 0.010 nm

(B) 0.040 nm

(C) 0.20 nm

(D) 0.062 nm

30. Identify the true statement?
(A) In the Frenkel defect, an equal number of cations and anions are missing to maintain electrical neutrality.
(B) Schottky defects increases the density of the ionic solid.
(C) Frenkel defects do not affect the density of the ionic solid.
(D) Schottky defect is created when the smaller ion is dislocated from its normal site to an interstitial site.

31. The phasor diagram for alternating quantities can be drawn if they are ---------- waves.
(A) Rectangular
(B) Sinusoidal.
(C) Triangular
(D) Any of these.

32. Power dissipated in 10 Ω resistance when a voltage of v=100+100sin314t is applied across it will be
(A) 2966 W
(B) 1579 W
(C) 1448 W
(D) 1488 W

33. If a series circuit is excited by a voltage e=E sinωt where $LC<1/\omega^2$
(A) Current lags behind the applied voltage
(B) Current leads the applied voltage
(C) Current is in phase with the applied voltage
(D) Voltage across L and C are equal.

34. If the power factor of the 3-phase load circuit is 0.5, then reading of one wattmeter is
(A) Zero
(B) W/2
(C) W/3
(D) $\sqrt{3}W/2$

35. Kirchhoff's laws are valid for
(A) Linear circuits only
(B) Passive time invariant circuits
(C) Non-linear circuits only
(D) Both linear and non- linear circuits.

36. A resistance and inductance are connected in parallel across an ac source. The currents through the two parallel branches will have a phase difference
(A) 0 degree
(B) 90 degree
(C) 180 degree
(D) 45 degrees

37. A coil wound around a magnetic ring is required to produce a flux of 800×10^{-6} Wb. What is the magnitude of the mmf required to set up the flux if the reluctance of the ring is 1.675×10^{-6} AT/Wb.

(A) 13.4 AT
(B) 134 AT
(C) 1340 AT
(D) 1.34×10^{6} AT

38. The mutual inductance between two closely coupled coils is 0.5 H. The coils are rewound to reduce the number of turns in one coil 1/3 and to increase in the other by three times. The new mutual inductance of the coils is
(A) 0.25 H
(B) 0.5 H
(C) 0.75 H
(D) 1.5 H

39. The output of a transformer at full load and unity power factor is 400kW. What is the output at 0.8 power factor and at half load?

(A) 200 W
(B) 320 W
(C) 160 W
(D) 100 W

40 Which of the following is not an expression for the power delivered to the load by a DC machine?

(A) VI_a (B) $\frac{E-I_a r_a}{I_a}$

(C) $V\frac{(E-V)}{R_L}$ (D) EI_a

41. In bipolar transistor biased in the forward active region the base current is I_B =40 μA and the collector current is I_C =2.48 mA. The α is

A) 62
B) 0.016
C) 0.984
D) 0.815

42. In a n-channel JFET, for the drain current to be maximum, gate-to-source voltage should be

A) Negative
B) Positive
C) Zero
D) Drain current is independent of gate-to-source voltage

43. The form factor in a full wave rectifier is equal to

A) 1.57
B) 1.11
C) 1.21
D) Zero

44. In an RC phase shift oscillator having three stages, the amplifier in order to satisfy barkhausen criterion should have a minimum gain of

A) 10
B) 29
C) 31
D) None of these

45. The bandwidth of a CRO is from upto 20 MHz. The fastest rise time a sine wave can have to be accurately reproduced by the instrument is

A) 35 ns
B) 50 ns
C) 12.5 ns
D) 17.5 ns

46. An FM signal with a deviation 'd' is passed through a mixer, and has its frequency reduced five-fold. The deviation in the output of the mixer is

A) 5.d
B) d/5
C) d
D) Indeterminate

47. A pre-emphasis circuit provides extra noise immunity by

A) Boosting the bass frequencies
B) Amplifying the high audio frequencies
C) Pre-amplifying the whole audio band
D) Converting the frequency modulation to PM

48. In a Karnaugh map for an eight-variable Boolean function, a certain group corresponds to a term having two literals. It should be a group of
    A) 16
    B) 32
    C) 64
    D) 128
49. A 10 KHz clock signal having a duty cycle of 25% is used to clock a three-bit binary ripple counter. What will be the frequency and duty cycle of the true output of the MSB flip-flop?
    A) 1.25 KHz, 25%
    B) 1.25 KHz, 50%
    C) 3.33 KHz, 25%
    D) 3.33 KHz, 50%
50. Slew rate of an op-amp is an indication of
    A) Capacity to handle low amplitude signals
    B) Capacity to handle high frequency signals
    C) Capacity to handle noisy signals
    D) Capacity to handle fluctuations in supply voltage
51. How long can a filename in LINUX be?
    A) 8
    B) 10
    C) 200
    D) 255
52. Every command in a LINUX is
    A) Text file
    B) Stored variable
    C) Executable programme
    D) None
53. The program

```
main() {
float b = 0.7; printf("%d, %f", b, b); }
```

    prints
    A) a garbage value, 0.7
    B) 0, 0.000000
    C) 7, 0.7
    D) an error message
54. The rule for implicit conversion is
    A) int < unsigned < float < double
    B) unsigned < int < float < double
    C) int < unsigned < double < float
    D) unsigned < int < double < float

55. If p is a pointer to an integer and t is a pointer to a character then sizeof(p) will be

A) same as that of sizeof(t)
B) more than that of sizeof(t)
C) less than that of sizeof(t)
D. none of the above

56. The use of macro in the place of functions

A) reduces execution time and reduces code size
B) reduces code size and increases execution time
C) increases execution time and increases code size
D) increases code size and reduces execution time

57. a→b is syntactically correct if

A) a and b are structures
B) a is a structure and b is a pointer to structure
C) b is a structure and a is a pointer to structure
D) a is a pointer to structure and b is a field

58. The statement fseek (fp, 0L, 0); means

A) fp is a file pointer and position the read-write-head at the start of the file
B) fp is a file pointer and position the read-write-head at the end of the file
C) fp is a file pointer and position the read-write-head at the value specified in L of the file
D) erase the contents of the file

59. If x is an array of integer, then the value of &x[i] is same as

A) &x[i – 1] + sizeof(int)
B) x + sizeof(int) * i
C) x + i
D) ++ (&x[i])

60. Choose the correct statement

A) In a struct, the access control is public by default
B) In a struct, the access control is private by default
C) In a class, the access control is public by default
D) In a class, the access control is protected by default

61. The maximum possible thermal efficiency of a heat engine working between 27°C and 327°C is

A) 100% B) 95.69% C) 66.67% D) 50%

62. The heat absorbed by water at its saturation temperature to get converted into dry steam at the same temperature is called

A) Sensible heat B) Specific heat
C) Latent heat D) Total heat

63. For the same compression ratio, efficiency of dual combustion cycle is

A) Greater than Otto cycle B) Less than Diesel cycle
C) Less than Otto and greater than Diesel cycle D) Greater than both Otto and Diesel cycle

64. There is no geometrical distinction between the streamline, pathline and streakline in case of

A) Irrotational flow B) Uniform flow
C) Steady flow D) None of these

65. The range for coefficient of discharge for a venturimeter is

A) 0.6 to 0.7 B) 0.7 to 0.8 C) 0.8 to 0.85 D) 0.95 to 0.99

66. Bernoulli's equation deals with the conservation of

A) Mass B) Momentum C) Energy D) None of these

67. Two wires of the same material have lengths in the ratio 1:2 and their radii are in ratio of $1:\sqrt{2}$. If they are stretched by applying equal forces, the increase in their lengths will be in ratio of

A) $2:\sqrt{2}$ B) $\sqrt{2}:2$ C) 1:1 D) 1:2

68. In a simply supported beam carrying a uniformly distributed load of 30kN/m over the whole span of 4 m, the maximum bending moment is equal to

A) 120 KNm B) 60 KNm C) 80 KNm D) None of these

69. The shaft A and B are made of same material. The diameter of shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to that of shaft B is

A) 1/8 B) 1/16 C) ¼ D) None of these

70. Kelvin-Plank's law deals with the

A) Conservation of energy B) Conservation of mass
C) Conservation of heat into work D) None of these

71. The process of losing water from leaves plants is towered a

A) Surface evaporation B) Water surface evaporation
C) Transpiration D) Precipitation

72. Self purification of stream is retarded by

A) Higher Temperature B) Sunlight
C) Satisfying Oxygen demand D) None of these

73. Pollution of air due to smoking by a person is classified under

A) Personal air pollution B) Occupational air pollution
C) Community air pollution D) None of these

74. What type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials?

A) Source noise B) Reflection noise
C) Structural noise D) Direct air-borne noise

75. Troposphere is the

A) Lowermost atmospheric zone
B) Uppermost atmospheric zone
C) Atmospheric zone extending between stratosphere and ionosphere
D) None of above

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P.U.L.E.E.T.-2014

ANSWERS / KEY

1	2	3	4	5	6	7	8	9	10
A	C	X	C	C	B	C	D	A	B
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
D	C	B	C	A	D	C	D	A	D
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
A	B	B	A	C	A	A	C	D	C
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
B	D	B	A	D	B	C	B	C	D
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
C	C	B	B	X	C	B	C	B	B
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
D	C	B	A	A	D	D	A	C	A
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
D	C	C	C	D	C	C	B	A	C
71	**72**	**73**	**74**	**75**					
C	A	A	B	A					

Note : An 'X' in the key indicates that either the question is ambiguous or it has printing mistake. All candidates will be given credit for this question.