

## PULEET- 2013

**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*

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O.M.R. Answer Sheet Serial No.

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*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 No. 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.

- What can you say about the consistency of the following system of equations  
 $x-y+z = -1$ ,  $x-y+z = 1$ ,  $x-y-z = -1$  ?  
 (A) Consistent and has a unique solution (B) No solution  
 (C) Consistent has infinite solutions (D) None of these
- What is the distance between the lines  
 $\frac{x}{5} = \frac{y-2}{2} = \frac{z-3}{3}$ ,  $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$  ?  
 (A)  $\sqrt{21}$  (B)  $\sqrt{11}$  (C) 2 (D) 1
- Given that  $f(0)=g(0)=1$ ,  $f'(1)=-1/3$ ,  $g'(0)=1/3$ . What is the value of the derivative of  $f(x+g(x))$  with respect to  $x$  at  $x=0$  ?  
 (A)  $-4/9$  (B)  $2/9$  (C)  $1/3$  (D) zero.
- The region in the first quadrant enclosed by parabola  $y = x^2$ ,  $y$ -axis and the line  $y=1$  is revolved about the line  $x = \frac{3}{2}$  to generate a solid. What is the volume of the solid?  
 (A)  $\pi$  (B)  $2\pi$  (C)  $6\pi$  (D)  $3\pi/2$
- What is the length of the curve  $x = \int_0^y \sqrt{\sec^4 t - 1} dt$ ,  $-\pi/4 \leq y \leq \pi/4$  ?  
 (A) 6 (B) 2 (C)  $2\pi$  (D) 1
- What is the area of the surface generated by revolving the curve  $y=x^3$ ,  $0 \leq x \leq 1/2$ , about  $x$ -axis?  
 (A)  $61\pi/1728$  (B)  $2\pi/3$  (C)  $3/4$  (D)  $7/8$
- What is the curvature of the curve  $y = \ln(\cos x)$ ,  $-\pi/2 < x < \pi/2$  at the point of inflection?  
 (A) 1 (B) 2 (C) 0 (D) None of these.
- If  $|a|$  is much greater than  $|b|, |c|$  and  $|d|$ , to which of  $a, b, c$  and  $d$  is the value of the function  $f(a, b, c, d) = ad - bc$  is most sensitive?  
 (A)  $a$  (B)  $b$  (C)  $c$  (D)  $d$ .



9. What is the maximum value of  $x^2 + y^2$  subject to the constraint  $x^2 - 2x + y^2 - 4y = 0$ ?

- (A) 20 (B) 30 (C) 40 (D) None of these

10. The derivative of  $f(x,y)$  at  $(1,2)$  in the direction of  $\hat{i} + \hat{j}$  is  $2\sqrt{2}$  and in the direction  $-2\hat{j}$  is -3. What is the derivative of  $f$  in the direction  $-\hat{i} - 2\hat{j}$ ?

- (A) 2 (B) 7 (C)  $\frac{3}{\sqrt{5}}$  (D)  $-\frac{7}{\sqrt{5}}$

11. What is the volume of the solid cut from the first octant by the surface  $z = 4 - x^2 - y^2$ ?

- (A)  $\frac{120}{19}$  (B)  $\frac{112}{15}$  (C)  $\frac{22}{7}$  (D) None of these

12. What is the value of the integral  $\int_{(1,1,1)}^{(2,3,-1)} ydx + xdy + 4dz$  over the line segment from  $(1,1,1)$  to  $(2,3,-1)$ ?

- (A) -3 (B) 2 (C) 0 (D) 1

13. What is the counterclockwise circulation of the field  $\vec{F} = (y^2 - x^2)\hat{i} + (y^2 + x^2)\hat{j}$  around the curve  $C$ : The triangle bounded by  $y=0$ ,  $x=3$  and  $y=x$ ?

- (A) 0 (B) 9 (C) 2 (D) None of these

14. What is the value of the integral  $\iint_S \nabla \times (y\hat{i}) \cdot \hat{n} d\sigma$  where  $S$  is the hemisphere

$$x^2 + y^2 + z^2 = 1, z \geq 0?$$

- (A)  $\pi$  (B) 0 (C)  $2\pi$  (D)  $-\pi$

15. What is the net outward flux of the field  $\vec{F} = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{\sqrt{x^2 + y^2 + z^2}}$  across the boundary

of the region  $D: 0 < a^2 \leq x^2 + y^2 + z^2 \leq b^2$ ?

- (A) 0 (B) 1 (C) 2 (D) 3



- 16) Dulong and Petit's rule says that
- (A) Specific heat of the crystalline solids is constant.
  - (B) Specific heat of insulators is more than the conducting solids.
  - (C) Specific heat of solids falls exponentially with temperature.
  - (D) Specific heat of solids rises linearly with the temperature.
- 17) The amount of mechanical work done to melt 1 g of ice is
- (A) 4.2 J
  - (B) 42 J
  - (C) 80 J
  - (D) 336 J
- 18) The rate of transfer of heat is maximum in
- (A) Conduction
  - (B) Convection
  - (C) Radiation
  - (D) Same in all modes
- 19) Which of the following is an example of a motion where speed is constant but velocity changes continuously.
- (A) Simple harmonic motion
  - (B) Uniform rotational motion
  - (C) Inclined motion
  - (D) Non uniform motion
- 20) In a uniformly oscillating pendulum, the acceleration is maximum
- (A) at mean position.
  - (B) just before approaching the mean position.
  - (C) at extreme position.
  - (D) just before the approaching the extreme position.
- 21) Streamlining of aeroplanes is done to reduce
- (A) rolling friction
  - (B) sliding friction
  - (C) fluid friction
  - (D) All of above
- 22) When the light is incident on a medium at the polarizing angle,
- (A) the reflected light is completely polarized.
  - (B) the reflected light is partially polarized.
  - (C) the transmitted light is completely polarized.
  - (D) Both reflected and transmitted light are completely polarised.



- 23) Acronym Laser stands for
- (A) Light Amplification by stimulated emission of radiation.
  - (B) Light Amplification by spontaneous emission of radiation.
  - (C) Light Amplification by systematic emission of radiation.
  - (D) Light Amplification by selective emission of radiation.
- 24) The velocity of light in a given medium is
- (A) directly proportional to refractive index of the medium.
  - (B) inversely proportional to refractive index of the medium.
  - (C) equal to refractive index of the medium.
  - (D) independent of refractive index of the medium.
- 25) Which of the following statement is correct?
- (A) Quantum mechanics is an approximation of classical mechanics.
  - (B) Classical mechanics is an approximation of quantum mechanics.
  - (C) Classical mechanics describes the behaviour of microscopic bodies only.
  - (D) Quantum mechanics describes the behaviour of macroscopic bodies only.
- 26) The most efficient packing of spheres is
- (A) Hexagonal close packing.
  - (B) Tetragonal cubic packing.
  - (C) Cubic close packing.
  - (D) Both Hexagonal and cubic close packing.
- 27) In a nuclear reactor, the function of the Boron rods is to
- (A) slow down the neutrons.
  - (B) speed up the reaction.
  - (C) absorb gamma radiations.
  - (D) absorb excess neutrons.
- 28) The potential energy of a dipole (dipole moment  $p$ ) placed in magnetic field  $B$  is minimum when
- (A)  $p$  is perpendicular to  $B$ .
  - (B)  $p$  is parallel to  $B$ .
  - (C)  $p$  is anti-parallel to  $B$ .
  - (D)  $p$  is inclined to  $B$ .
- 29) Which of the following is true?
- (A) The resistance of an ideal ammeter is zero and of an ideal voltmeter is infinite.
  - (B) The resistance of an ideal ammeter is infinite and of an ideal voltmeter is zero.
  - (C) The resistance of an ideal ammeter is less than 10 ohm and of an ideal voltmeter is more than 10 ohm.
  - (D) The resistance of an ideal ammeter is more than 10 ohm and of an ideal voltmeter is less than 10 ohm.
- 30) Induced emf can be generated by changing
- (A) The magnitude of the magnetic induction only.
  - (B) The area of the coil linked with the magnetic field only.
  - (C) The relative orientation of magnetic field and the area of the coil only.
  - (D) All of these.



31. The form factor is the ratio of  
A. average value to rms value  
B. rms value to average value  
C. peak value to average value  
D. peak value to rms value
32. The form factor of half wave rectified alternating current represented by  $i = 20 \sin \omega t$ .  
A. 1.1  
B. 1.57  
C. 2  
D. 0.5
33. A wattmeter can measure  
A. ac power only  
B. dc power only  
C. ac and dc power both  
D. dc power and ac power after rectification
34. In a 4-pole d.c. machine, 90 mechanical degrees corresponds to \_\_\_\_\_ electrical degrees.  
A. 22.5  
B. 180  
C. 270  
D. 45
35. If the Cu loss of a transformer at  $7/8^{\text{th}}$  full load is 4900W, then its full load Cu loss would be \_\_\_\_\_ watt  
A. 5600  
B. 6400  
C. 375  
D. 429
36. Permeability is reciprocal of  
A. Reluctivity  
B. Susceptibility  
C. Permittivity  
D. Conductivity
37. Speed of d.c. series motor at no load is  
A. zero  
B. 3000 rpm  
C. 3600 rpm  
D. Infinity
38. Wave excitation of a stepper motor results in  
A. Micro-stepping  
B. Increased step angle  
C. Half stepping  
D. Reduced resolution
39. The efficiency and p.f. of a squirrel cage induction motor increases in proportion to its  
A. Speed  
B. Rotor torque  
C. Voltage  
D. Mechanical load
40. If a single phase induction motor runs slower than normal, the more likely defect is  
A. Improper fuses  
B. Shorted running winding  
C. Worn bearings  
D. Open starting winding



41. A gate in which all inputs must be low to get a high output is called

- (A) a NOR gate
- (B) An inverter
- (C) an AND gate
- (D) a NAND gate

42. In bipolar transistor biased in the forward active region the base current is

$I_B = 50 \mu A$  and the collector current is  $I_C = 2.7 \text{ mA}$ . Then  $\alpha$  is

- (A) 0.949
- (B) 54
- (C) 0.982
- (D) 0.018

43. In 50 % modulated AM signal, the carrier is suppressed before transmission. The saving in transmitted power would be

- (A) 88.9 %
- (B) 11.1%
- (C) 72 %
- (D) 18 %

44. The minimum no. of NOR gates required to implement  $A(A+B')(A+B'+C)$  is equal to

- (A) 0
- (B) 3
- (C) 4
- (D) 7

45. The input resistance of a Cathode Ray Oscilloscope is of the order of

- (A) tens of ohm
- (B) mega ohm
- (C) kilo ohm
- (D) fraction of an ohm

46. NRZ means

- (A) Non Radiation Zero
- (B) Not Referred as Zero
- (C) None of these
- (D) Non Return to Zero

47. How is a JK flip flop made to toggle?

- (A)  $J=0, K=0$
- (B)  $J=0, K=1$
- (C)  $J=1, K=0$
- (D)  $J=1, K=1$

48. The peak inverse voltage (PIV) across a non conducting diode in a bridge rectifier equals approximately:

- (A) half the peak secondary voltage
- (B) twice the peak secondary voltage
- (C) the peak value of the secondary voltage
- (D) four times the peak value of the secondary voltage

49. An ideal operational amplifier has

- (A) infinite output impedance
- (B) zero input impedance
- (C) infinite bandwidth
- (D) All of the above



50. Field Effect Transistor is

(A) Current controlled device

(B) Voltage Controlled device

(C) Power Controlled Device

(D) None of these.

51. The output generated by the program

```
#include<stdio.h>
int f(int x);
main()
{
    int b,d;
    for (d=1;d<=4;++d) { b=f(d); printf("%d ", b); }
}
int f( int x)
{ int y=0; y+=x; return(y); }
```

will be

- A. 1 3 6 10
- B. 2 4 9 16
- C. 1 2 3 4
- D. None of the above.

52. Data type for the expression (((int) f) + ix) for the C code containing the following declaration

```
int i,j; long ix; short s; float x; double f;
will be
```

- A. int
- B. float
- C. double
- D. long

53. The output generated by the program

```
#include<stdio.h>
main()
{
    int i=0, x=0;
    for ( i=1; i<5; ++i)
    { if ( i % 2) == 1) x += i;
      else x --;
      printf ("%d ", x); }
}
```

will be

- A. 1 0 2 3
- B. 1 1 0 2
- C. 1 2 3 4
- D. 1 0 3 2

54. The value of Z[0][2] in the initialization int Z[3][4] = {{1,2}, {5,6,9}} will be

- A. 5
- B. 0
- C. Not defined
- D. 2

55. The declaration int Z[ ][3] = {{1,3}, {5}, {3,8}}; represents

- A. array having 3 rows and 3 columns.
- B. array having 1 row and 3 columns.
- C. array having 3 rows and 1 columns.
- D. None of the above.



56. Programming language C allows a function to be called

- A. only by value
- B. only by reference
- C. by value for a fixed number of times and by reference by many number of times.
- D. by value as well as by reference

57. Which is/are true in context of C language:

- a. Only one member can be used at a time in case of Union.
  - b. Unions can act as members of Structure
  - c. Structures can act as members of Union
  - d. A Structure may contain bit field
- A. a,b, c and d.      B. b,c, and d  
C. c and d      D. a, b and c

58. The function call `fseek( file, 0, 0 );` is equivalent to

- A. `rewind(file).`      B. `file = fopen( ).`  
C. `ftell ( file ).`      D. `fclose( )`

59. Which of the following memories must be refreshed many times per second?

- A. ROM.      B. EPROM.  
C. Dynamic RAM      D. Static RAM

60. Which is false

- A. Class in Object Oriented Programming language acts as blueprint of object.
- B. Encapsulation is the property by which many of the class functions with same name but different signatures exist.
- C. Abstraction is the process of hiding deeper details from the outer world
- D. Inheritance provides reusability.

61. According to Kelvin-Planck statement PMM of

- A) first kind is possible      B) second kind is possible  
C) third kind is possible      D) second kind is impossible

62. In which of the apparatus enthalpy of steam always increases?

- A) Turbine      B) Superheater  
C) De Superheater      D) Condenser

63. The process of expansion in an IC engine cylinder has close approximation

- A) isochoric process      B) adiabatic process  
C) isothermal process      D) isobaric process



64. If the stream function satisfies Laplace equation then

- A) flow is rotational
- B) flow is irrotational
- C) flow is impossible
- D) none of these

65. Bernoulli's equation of motion is given by

- A)  $\frac{P}{\rho} + gz + \frac{z^2}{2} = \text{constant}$
- B)  $\frac{P}{\rho} + z + \frac{v^2}{2} = \text{constant}$
- C)  $\frac{P}{\rho} + gz + \frac{v^2}{2} = \text{constant}$
- D) none of these

66. A Rotameter is used to measure

- A) discharge
- B) velocity
- C) temperature
- D) viscosity

67. Flow of river can be measured using a

- A) notch
- B) weir
- C) orifice metre
- D) Pitot tube

68. Two tie rods are connected through a pin of a cross-sectional area of  $40\text{mm}^2$ . If the tie rods carry a tensile load of  $10\text{kN}$ , the shear stress in the pin is

- A)  $125\text{MPa}$
- B)  $250\text{MPa}$
- C)  $500\text{MPa}$
- D)  $210\text{MPa}$

69. A beam carries transverse loads. Shear force and bending moment diagrams for the beam are drawn. In the portion of the beam, shear force remains zero, bending moment is

- A) maximum
- B) minimum
- C) constant
- D) zero

70. Torsional rigidity of a shaft is given by

- A)  $\frac{T}{G}$
- B)  $\frac{T}{J}$
- C)  $JG$
- D) none of these

where  $T$  is torque,  $G$  is shear modulus and  $J$  is polar moment of inertia.



71. Environment means
- A) A beautiful landscape
  - B) Industrial production
  - C) Sum total of all conditions that affect the life and development of all organisms on earth
  - D) Revolution of life
72. Primary and secondary waste water treatment is based on
- A) Screening of solid matter only
  - B) Injecting air stream only
  - C) Screening, sedimentation, aerobic digestion and sedimentation
  - D) Chemical precipitation
73. Water treatment for drinking water supply requires
- A) Filtration through sand bed
  - B) Disinfection by chlorination to kill viruses, bacteria etc.
  - C) Sedimentation
  - D) All of above
74. The Greenhouse effect is due to
- A) Carbon dioxide, water vapour, methane and chlorofluorocarbons
  - B) Nitrogen oxides
  - C) Sulphur oxides
  - D) Smog
75. Photochemical smog arises from
- A) Ozone and methane in presence of sunlight
  - B) Carbon monoxide and sulphur dioxide
  - C) Photochemical reaction of hydrocarbons, ozone, carbon monoxide and nitrogen oxides.
  - D) Oxygen nitrogen and water vapour
-