

# MIZORAM PUBLIC SERVICE COMMISSION

## GENERAL COMPETITIVE EXAMINATIONS FOR RECRUITMENT TO THE POST OF JUNIOR ENGINEER UNDER IRRIGATION & WATER RESOURCES DEPARTMENT OCTOBER, 2018

### AGRICULTURE ENGINEERING PAPER-II

Time Allowed : 2 hours

Full Marks : 150

*All questions carry equal marks of 2 each.  
Attempt all questions.*

- Maximum size of raindrop varies from
  - 0.5mm-7.0mm
  - 0.5mm-6.0mm
  - 0.6mm-7.0mm
  - 0.5mm-8.0mm
- Precipitation caused by natural rising of warmer lighter air in colder, denser surrounding is called
  - Orographic precipitation
  - Convective precipitation
  - Frontal precipitation
  - Both (a) & (c)
- Precipitation is said to be drizzle when the water droplets and its intensity is
  - <0.5mm & <0.01 mm/hr respectively
  - >0.5mm & >0.01 mm/hr respectively
  - <0.5mm & >0.01 mm/hr respectively.
  - <0.05mm & <0.1 mm/hr respectively
- Graph showing plot of cumulative depth of rainfall against time is
  - Hyetograph
  - Mass curve
  - Hydrograph
  - S-Curve
- For a slope % of 15-35, the land use classification can be characterized as
  - Class III
  - Class IV
  - Class V
  - Class VI
- Calculate the volume of earthwork involved in contour bunding for a 100ha catchment area having a land slope of 3%, if the parameters for contour bund are to be VI=1.5m; base width=2.25m; top width=0.50m; height of bund=1.0m. Assume 30% lateral and side bunds of the main bunding.
  - 35750m<sup>3</sup>
  - 35000m<sup>3</sup>
  - 35570m<sup>3</sup>
  - 35770m<sup>3</sup>
- The Froude number is given by the equation
  - $F = \frac{g}{\sqrt{DV}}$
  - $F = \frac{D}{\sqrt{gV}}$
  - $F = \frac{V}{\sqrt{gD}}$
  - $F = \frac{V}{g\sqrt{D}}$
- A drop spillway is subjected to horizontal and vertical forces of 40.8kN and 36.5kN respectively. The area of plane if sliding is 10m<sup>2</sup>. Angle of internal friction and cohesive resistance of foundation material are 25° and 4.9kP<sub>a</sub> respectively. The factor of safety against sliding is
  - 0.53
  - 0.61
  - 1.62
  - 1.86

9. A 24hr 10 year recurrence interval storm results in 0.5m depth of water behind the contour bund constructed on loamy sand soil having slope of 2%. The base width of the bund is
- (a) 3.75m (b) 3.25m  
(c) 3.50m (d) 3.00m
10. Chute spillway is used in control a drop of
- (a) 0-3m (b) 1-4m  
(c) 2-4m (d) 3-6m
11. For a large discharge capacity, a chute spillway inlet should be
- (a) Rounded rectangular box type inlet (b) Flat rectangular inlet  
(c) Straight inlet (d) Concave shaped rectangular inlet
12. Drop structures are used to control
- (a) V-shaped gullies (b) U-shaped gullies  
(c) Ravine (d) Both (a) & (b)
13. In  $EI_{30}$ ,  $I_{30}$  stands for
- (a) Rainfall intensity as 30cm (b) Max. Rainfall intensity for 30cm duration  
(c) Rainfall intensity at 30min interval (d) None of these
14. A straight drop structure consists of
- (a) Inlet and outlet (b) Apron, weir and conduit  
(c) Inlet, conduit and outlet (d) Earth dam and outlet
15. Location of permanent gully control structure is decided on the basis of
- (a) Gully depth (b) Gully width  
(c) Gully bed slope (d) All of these
16. Purpose of Cut of Wall in drop structure is to
- (a) Provide structure strength against sliding (b) Spill the flow safely  
(c) Dissipate K.E. (d) Support gully walls
17. Hydraulic jump takes place when the flow enters from
- (a) Critical state to super critical state (b) Super critical to sub critical state  
(c) Subcritical state to super critical state (d) Uniform flow to non-uniform flow
18. General form of relationship between  $EI_{30}$  and rainfall depth is
- (a)  $EI_{30} = aP^b$  (b)  $EI_{30} = 1 \exp(P)$   
(c)  $EI_{30} = a + b \log P$  (d)  $EI_{30} = a + bP$
19. A chute spillway with box type inlet consists of
- (a) SAF stilling basin (b) Ogee type inlet  
(c) Apron (d) None of these
20. Drop inlet spillway also performs the function of
- (a) Farm pond (b) Reservoir  
(c) Irrigation structure (d) Both (a) & (b)
21. To obtain cement dry powder, lime stone and shales or their slurry, is burnt in a rotary kiln at a temperature between
- (a) 1100° and 1200° (b) 1300° and 1400°  
(c) 1200° and 1300° (d) 1400° and 1500°

22. The maximum percentage of chemical ingredient of cement is  
(a) Magnesium oxide (b) Aluminum  
(c) Iron oxide (d) Lime
23. The minimum percentage of chemical ingredient of cement is that of  
(a) Magnesium oxide (b) Iron oxide  
(c) Silica (d) Alumina
24. The high strength of rapid hardening cement at early stage, is due to its  
(a) Finer grinding (b) Burning at high temperature  
(c) Increased lime cement (d) High content of tricalcium
25. Water cement ratio is generally expressed in volume of water required per  
(a) 10kg (b) 20kg  
(c) 30kg (d) 50kg
26. Addition pozzolana to ordinary port land cement causes  
(a) Decrease in early strength (b) Reduction in chemical action with sulphates  
(c) Increase in shrinkage (d) All of these
27. Setting time of cement increases by addition of  
(a) Gypsum (b) Calcium chloride  
(c) Sodium oxide (d) Calcium sulphate
28. Workability of cement is measured by  
(a) Vicat apparatus test (b) Slump test  
(c) Minimum void method (d) Talbot Richard test
29. The mixture of different ingredients of cement is burnt at  
(a) 1000°C (b) 1200°C  
(c) 1400°C (d) 1600°C
30. For construction of structure in sea water, the cement generally preferred to, is  
(a) Portland-pozzolana cement (b) Quick setting cement  
(c) Low heat Portland cement (d) Rapid hardening cement
31. The difference between a shallow tube-well is on the basis of  
(a) Depth of tubewell (b) Position of water table & pump  
(c) Aquifer type (d) Aquifer depth
32. For a constant discharge if the diameter of a pipe is reduced to half, other factors remaining unchanged, the frictional head loss will increase by  
(a) 4 times (b) 8 times  
(c) 16 times (d) 32 times
33. The brake horse power of a centrifugal pump varies directly  
(a) As speed of impeller (b) As cube speed of impeller  
(c) As square speed of impeller (d) As forth power the speed of impeller
34. Safe entrance velocity through a well screen is  
(a) 0.3mm/s (b) 3.0mm/s  
(c) 30mm/s (d) 300mm/s

35. Cavity well with blind pipe
- (a) Do not have strainers & water enters from bottom.
  - (b) Do not have strainers & water enters from sides.
  - (c) Have strainers & water enters from bottom.
  - (d) Have strainers & water enters from bottom and sides
36. Keeping other factors constant, doubling the diameter of a tubewell will increase the discharge by
- (a) 10%
  - (b) 25%
  - (c) 50%
  - (d) 100%
37. If the impeller speed of a centrifugal pump is doubled, the power consumption will be
- (a) The same
  - (b) Doubled
  - (c) Four times
  - (d) Eight times
38. The available net positive suction head of a pump depends on
- (a) The suction lift
  - (b) Friction loss
  - (c) Vapour pressure
  - (d) All of these
39. The well in which the water level remains at the water table level is
- (a) Non-artesian wells
  - (b) Flowing artesian wells
  - (c) Non-flowing artesian wells
  - (d) Confined wells
40. A centrifugal pump running at 1450 rpm discharges 20ltrs/s at 30m total head. The specific speed of the pump will be
- (a) 12
  - (b) 16
  - (c) 20
  - (d) 24
41. In a centrifugal pump, if the speed is increased from 1750 rpm to 2000rpm, the head will change from 50m to
- (a) 38.3m
  - (b) 65.3m
  - (c) 56.3m
  - (d) 100m
42. A centrifugal pump has a cavitation coefficient of 0.3. For a total head of 50m the net positive suction head at the critical point will be
- (a) 12m
  - (b) 10m
  - (c) 15m
  - (d) 166.7m
43. A cavity well is most suitable under the following conditions
- (a) Aquifer with fine sand & small thickness
  - (b) Aquifer with coarse sand & small thickness
  - (c) Aquifer with coarse sand & large thickness
  - (d) Aquifer with coarse sand & hard covering layer
44. A centrifugal pump at its best point of efficiency discharge  $0.03\text{m}^3$  of water per second against a total head of 40m when the speed is 1450 rpm. Then the specific speed of the pump is
- (a) 15.00rpm
  - (b) 15.77rpm
  - (c) 14.00rpm
  - (d) 14.77rpm
45. Suction lift exists in a centrifugal pump when the
- (a) Source of water supply is at the centre line of the pump
  - (b) Source of water supply is below the centre line of pump
  - (c) Source of water supply is above the centre line of pump
  - (d) None of these

46. In which surveying, the curvature of the earth is not taken into account, as the surveys only extends over the small scale surveying
- (a) Theodolite surveying (b) Geological surveying  
(c) Marine surveying (d) Plane table surveying
47. Perambulator is used to measure the
- (a) Distance (b) Speed  
(c) Pressure (d) Weight
48. The length of Gunter's chain is
- (a) 33ft (b) 200ft  
(c) 66ft (d) 20ft
49. The length of each link in engineering chain is
- (a) 0.66ft (b) 1ft  
(c) 0.33ft (d) 0.2ft
50. The horizontal angle between the true meridian and a line is called
- (a) True bearing (b) Magnetic bearing  
(c) Arbitrary bearing (d) Angle
51. The bearing of line in the direction of the progress of survey is called
- (a) Back bearing (b) Back ware bearing  
(c) Fore bearing (d) Line bearing
52. Method of surveying in which the fieldwork and plotting are done simultaneously is called
- (a) Compass surveying (b) Plane table surveying  
(c) Mapping (d) Drawing
53. Fixed reference point of known elevation is called as
- (a) Bench mark (b) Change point  
(c) Turning point (d) Reduce level
54. The contour interval on a map is 15m. if the upward gradient of 1 in 20 is required to be drawn between two points. The horizontal equivalent between A and B will be
- (a) 240m (b) 300m  
(c) 450m (d) 15m
55. Give the designation to the scale 1/1000
- (a) 1cm = 10m (b) 1cm = 100mm  
(c) 1cm = 100m (d) 1cm = 100cm
56. A cylinder bar of 40mm diameter and 1m length is subjected to a tensile test. Its longitudinal strain is 6 times that of its lateral strain. If the modulus of elasticity is  $2 \times 10^5 \text{ N/mm}^2$ , then its modulus of rigidity will be
- (a)  $0.86 \times 10^2 \text{ N/mm}^2$  (b)  $8.60 \times 10^2 \text{ N/mm}^2$   
(c)  $0.86 \times 10^5 \text{ N/mm}^2$  (d)  $8.60 \times 10^5 \text{ N/mm}^2$
57. A cantilever beam of length 4m having cross-sectional dimensions as 50mm x 150mm is failed by applying a force of 15kN at the free end. The bending stress at the failure is given by
- (a)  $480 \text{ N/mm}^2$  (b)  $320 \text{ N/mm}^2$   
(c)  $160 \text{ N/mm}^2$  (d) Zero

58. Good brick clay should contain an Alumina percentage of about  
(a) 10-20 (b) 20-30  
(c) 30-40 (d) 50-60
59. Silica contain in brick clay should be at the range of  
(a) 10-20 % (b) 40-50 %  
(c) 30-40 % (d) 50-60 %
60. Percentage shrinkage allowance provided on moulds for brick manufacture is  
(a) 2-6% (b) 8-12%  
(c) 32-24% (d) 8-14 %
61. The magnitude of the only shear stresses acting at a point in a plane stress situation is  $7.5 \text{ N/mm}^2$ . The magnitude of principal stress will be  
(a)  $+15.0 \text{ N/mm}^2$  &  $-7.5 \text{ N/mm}^2$  (b)  $+7.5 \text{ N/mm}^2$  &  $-15.0 \text{ N/mm}^2$   
(c)  $+7.5 \text{ N/mm}^2$  &  $-7.5 \text{ N/mm}^2$  (d)  $+100 \text{ N/mm}^2$  &  $-7.5 \text{ N/mm}^2$
62. A steel rod of circular section tapers from 2cm diameter to 1 cm diameter over a length of 50cm. If the modulus of elasticity of the material is  $2 \times 10^6 \text{ kg/cm}^2$ , then the increase in length under a pull of 300 kg will be  
(a)  $0.3/(2\pi) \text{ cm}$  (b)  $30/(2\pi) \text{ cm}$   
(c)  $300/\text{cm}$  (d)  $750\text{cm}$
63. In a biaxial stress problem, the stresses in x and y-directions are  $s_x = 200\text{MPa}$  and  $s_y = 100\text{MPa}$ . The Maximum principal stress in MPa is  
(a) 50 (b) 100  
(c) 150 (d) 200
64. The state of two-dimensional stresses acting on a concrete lamina consists of a direct tensile stress  $1.5\text{N/mm}^2$  and shear stress  $1.20\text{N/mm}^2$ , which cause cracking of concrete. Then, the tensile strength of the concrete in  $\text{N/mm}^2$  is  
(a) 1.50 (b) 2.08  
(c) 2.17 (d) 2.29
65. A timber beam rectangular section is simply supported at the ends and carries a concentrated load at mid span. The maximum longitudinal stress is  $16\text{N/mm}^2$  and the maximum shear stress is  $2.5\text{N/mm}^2$ . The ratio of span to depth would be  
(a) 10 (b) 4  
(c) 6 (d) 3.2

**Directions (Question Nos. 66 & 67) : Find the correct answer:**

66. 8, 7, 11, 12, 14, 17, 17, 22, (...)  
(a) 27 (b) 24  
(c) 22 (d) 20
67. 1, 1, 2, 6, 24, 96, 720  
(a) 6 (b) 2  
(c) 96 (d) 720

**Directions (Question No. 68) : Choose the word which best expresses the meaning of the given word:**

68. RABBLE  
(a) Mob (b) Roar  
(c) Rubbish (d) Noise

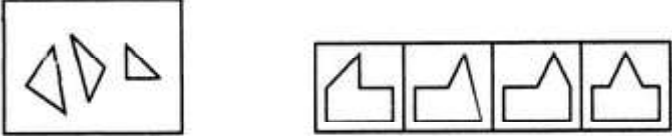
**Directions (Question No. 69) :** Pick out the most effective word(s) from the given words to fill in the blank to make the sentence meaningfully complete.

69. I.....a car to be absolutely necessary these days
- (a) Consider (b) Regard  
(c) Think (d) Agree

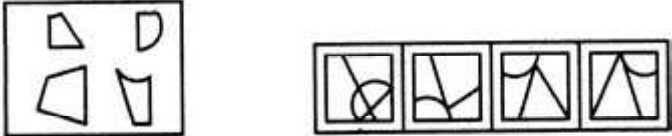
**Directions (Question No. 70) :** Which of phrases given below each sentence should replace the phrase printed in bold type to make the grammatically correct? If the sentence is correct as it is, mark 'D' as the answer.

70. He **should not had** done it
- (a) had not (b) should have  
(c) should not have (d) no correction required

**Directions (Question No. 71 & 72) :** Find out which of the figures in (1), (2), (3), (4) can be formed from the pieces given in figure (X)

71. 

(a) 1 (b) 2  
(c) 3 (d) 4

72. 

(a) 1 (b) 2  
(c) 3 (d) 4

73. If  $56 \times 11 = 9$ ,  $37 \times 13 = 6$ ,  $42 \times 12 = 3$ , then find the value of  $87 \times 77 = ?$
- (a) 5 (b) 4  
(c) 3 (d) 1

74. Today is Monday, after 61 days it will be?
- (a) Thursday (b) Tuesday  
(c) Wednesday (d) Saturday

**Directions (Question No. 75) :** Find the odd man out:

75. 8, 27, 64, 100, 125, 216, 343
- (a) 343 (b) 27  
(c) 100 (d) 125